A Database Publication

THE MICRO USER

Volume 6
Number 11
January 1989
£1.50

Top-selling guide to the BBC Micro, Master, Archimedes and Z88

NEWCOMER
Acorn's new Risc OS 2.0 previewed

TYPE-IN GAME
Can you keep the Beasty Bugs alive?

GET IT RIGHT!
At last – Checksums for the Archimedes

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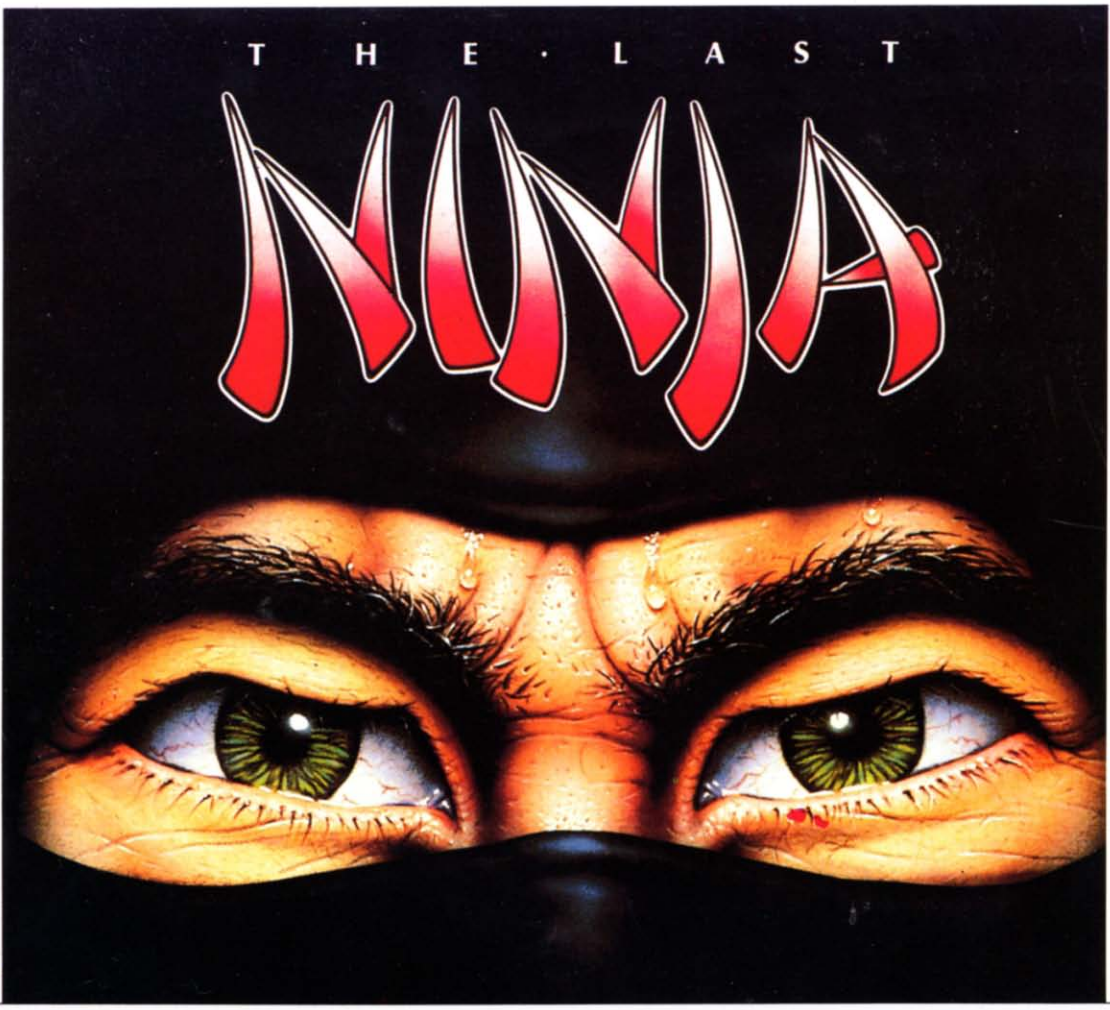
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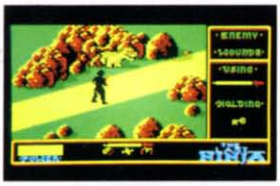
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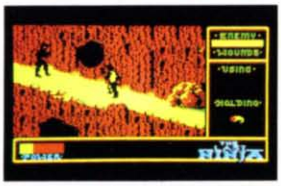
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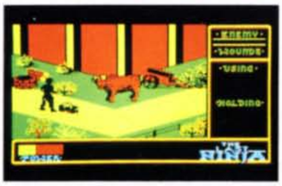
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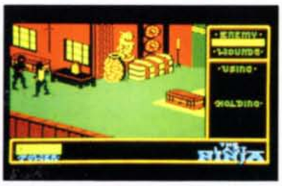
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LEVEL 6

THE LAST NINJA ... THE STATE OF THE MARTIAL ARTS

The secrets of the Ninjitsu way had been jealously guarded for centuries, only once every decade were the scrolls seen at the ritual of the White Ninja.

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(The screen pictures show the BBC Micro version of the game.)

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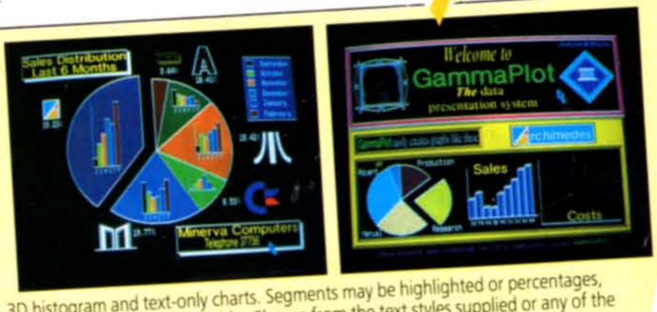

Seeing is believing! GammaPlot is an extensive chart/graph plotting program with a full art package included. It allows even a novice to produce stunning charts and drawings on one screen. Several charts may be placed on one sheet, in any position with text or drawings to make the data easily understood.

GammaPlot supports six main graph and chart types of line, scatter, pie, histogram, 3D histogram and text-only charts. Segments may be highlighted or percentages, values and labels switched on. Statistics are also available. Choose from the text styles supplied or any of the native Archimedes 'pretty fonts' or even define your own, and any of these can be enlarged or reduced. Various shapes, patterns and borders are supplied with a full 256 colour range. Full zoom facility. Various pen types are provided to draw pictures or add signatures. Import digitised pictures or company logos. Print facilities include colour output. Data entry is via the keyboard or any Delta, Gamma or Sigma file.

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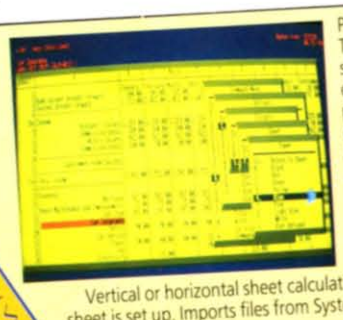

Probably the largest and fastest spreadsheet on any small business micro! The massive sheet size is 1000 columns by 16000 rows. Definable colours, spacing, and widths. Various cell formats including justification, up to 17 decimal places, preceding currency sign, bracketed or coloured negatives, percentage, exponential. Select to display the formulae instead of calculated sheet for really fast and easy sheet set up. Cell references may be alphanumeric or by label for ease of use, eg. A2 or "Jan" sales". Automatic relative or absolute reference adjustment while replicating. Simple yet extensive maths allowing calculations based upon references to other cells. Over 30 maths/statistical functions including SUM, AVG, COUNT, MAX, SIN, LOG, SQR, etc. Full date and time handling. Makes use of Maths co-processor, if fitted. Vertical or horizontal sheet calculation or intelligent mode which always gets it right no matter how the sheet is set up. Imports files from System Delta and most spreadsheets. Exports data to Gamma Range.

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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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Features

7 News
All the latest events in the ever-changing world of your BBC Micro.

23 Body Building
Our technical guru demonstrates more experiment board techniques.

25 Ceefax Guide
What's coming this month on the telesoftware pages of BBC TV.

26 Mad Hatter
Our monthly look at adventure games – old, new and revamped.

39 Hac Man
A wealth of useful hints and news from our resident games expert.

49 Progress Report
How does the Archimedes stand 18 months after its launch?

66 Exciting Futures
We preview the new Archimedes operating system from Acorn.

68 Wimps ✱
The beginning of a new series on using Basic on the Archimedes.

78 Graphics Arc ✱
This superb demo will show what your Archimedes can really do.

90 Recursion
A thought-provoking look at this fascinating programming topic.

116 Library ✱
More high quality routines which you can use in your own programs.

119 Problem Solved
A helping hand with some of those mind-testing hardware problems.

135 Letters
The chance to get your news, views, moans and name into print.

Game

125 Beasty bugs ✱
This novel test of strategy is a desperate scramble for survival.

Education

81 Update
Up-to-the-minute news of the BBC Micro in the world of education.

83 Butterflies
Discover a brand new world of learning material in this package.

45 Graphics
Yes, you really can produce high resolution graphics on your Z88! This month we describe a public domain utility to give you that power. The latest version – written by the original author of BBCBASIC(Z80) – is on the monthly disc just waiting for you to download.

87 Bush Rescue
Search the Australian Bush in this educational adventure for children.

115 Micro Art
We investigate computer graphics and its role in higher education.

Utilities

52 Disassembler ✱
A program to examine the Arthur OS down to the individual bytes.

59 Reconfigure ✱
Changing Archie ram allocations without the need to press Break.

63 Arc Right ✱
A checksum routine specifically written for Archimedes users.

95 Super Lister ✱
How to get easy-to-read hardcopy of your Basic programs every time.

Reviews

31 Software Scene
Our reviewers cast their eyes over the very latest games releases.

42 Real Time
3D graphics on your BBC Micro? It's not only possible – it's superb!

50 Software Quickies
We cast a glance at three new programs for BBC Micro or Master.

74 Watford Digitiser
Now you can get the outside world into your Archimedes very easily.

77 Flexscan Monitor
Need a first rate display for your Archimedes? Here's one to ponder.

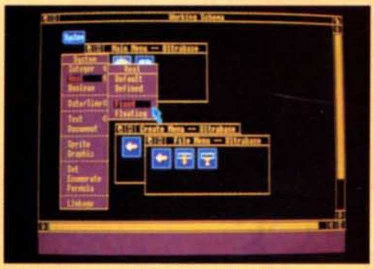
Cover story

Archimedes special issue

This month, starting on Page 49, there's a complete section full of articles and utilities especially written for the Acorn Archimedes. It includes a disassembler to let you study the intricacies of the operating system or debug your own code, the routine to produce the animated display shown on Page 78 and a utility to re-configure the ram allocations without pressing Break.

For anyone considering new hardware there are two reviews covering the quality graphics the super micro is capable of. And a new series starts, showing how easy it is to use Wimps in your own programs.

Archimedes OS improvements . . . Page 66



Program your own Wimps . . . Page 68

Hi-resolution display . . . Page 77

Digitise pictures . . . Page 74

MICRO USER CLASSIFIEDS

The best bargains in the world of the BBC Micro come from fellow readers of *The Micro User*. Turn to **Page 132** to find just what you're looking for – from cheap modems to complete computer systems.

✓ **For full details of how to use the Checksums, see the article on Page 28 of the February 1988 issue of *The Micro User***

✱ **The Type-it-in symbol indicates that the feature contains at least one full length listing for you to key in on your micro.**

NEXT MONTH

ARCHIMEDES
Classic arcade game
CHECKSUMS
How to use them
TIMING
Finding films on video
PROTECTION
New locking system

THE MICRO USER
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NEWS beat

Jewelled Hare for Sotheby's

A UNIQUE piece of computing history that was once the focus of attention at an Electron & BBC Micro User Show has suddenly surfaced after four years.

It is the internationally famous Jewelled Hare of Masquerade, made in 1979 as the prize connected with the hugely successful treasure hunt book Masquerade by Kit Williams.

Its hiding place was eventually discovered in 1982 but the finder later sold it for £20,000 to Haresoft – a company set up in 1984 to promote a computer game based on Masquerade.

After a BBC Micro version of the program was announced, the Jewelled Hare was displayed at the Electron & BBC Micro User Show in the summer of 1984. Database Exhibitions even hired a jaguar to guard it.

The computer game had two parts – Prelude and Finale – and it was anticipated that it would take at least 18 months to solve the puzzle and win the Jewelled Hare or an alternative cash prize of £30,000.

But the software was plagued by problems and Haresoft eventually went into liquidation – which is how the object came to be in the possession of Dennis Cross, the head of corporate recovery at Peat Marwick McLintock in Cambridge, who is handling the winding up of Haresoft.

Dennis Cross holds the Jewelled Hare

Discovering that the Hare was the company's chief asset, he decided to send it to Sotheby's for evaluation and auction.

"It is an exceptional item to find in a company's possession in such a situation", he said. "Selling it at Sotheby's is clearly the best way to make the most of its rarity value".

Archimedes strategy

TWO new entertainment packages for the Archimedes from Gem Electronics are Word Up Word Down and Startrader, price £17.95 each.

Word Up Word Down is a 3D board game giving an added dimension to Scrabble-type word play.

To add a further strategy element, the board has base squares of different strengths. If the stack of letters is greater than the base square can bear, the stack collapses.

Startrader is a large scale strategic space adventure covering 800 different planets in 112 star systems, 20 different types of spacecraft and realtime combat and docking sequences.

Mouse in control

AS a follow-up to Presenter, Lingenuity (0986 85476) has brought out another Archimedes software package called Control Panel, which enables mouse users to configure the Archimedes without having to type in complicated commands.

It also provides continuous on-screen help for inexperienced users and a facility to save and load specifically defined versions of configurations. Price £14.95.

Lingenuity has also announced its first Archimedes hardware product – the Colour Convertor.

The single-width expansion card with software converts the current monochrome Watford Video Digitiser into a full-colour digitiser with hardware control of both contrast and saturation. Price £149.95.

Inventors collect

A COMPUTERISED robotic arm to help disabled people feed themselves and a package for simulating a cane processing plant have scooped the top prizes in the 1988 Micro User Innovation Awards.

After massive support for this second year of the awards sponsored by *The Micro User*, the 11 finalists put their ideas on show at the Electron & BBC Micro User Show in London. The 10,000 visitors had a chance to see the entries and vote for their favourites.

In the BBC Micro category the winning entry came from North Staffordshire polio victim Mike Topping who created a micro driven robotic arm to help disabled people feed themselves.

For his innovative entry, Mike won an Archimedes donated by Acorn. The 32 bit machine comes with disc drive, mouse and colour monitor plus a Welcome disc containing an excellent painting package, a music editor and more. The prize is worth £1,034.

Winner in the Archimedes category went to father and son team Graham and Matthew Steven of Hampshire who used Matthew's Archimedes 310 to simulate the process dynamics of a cane sugar processing plant.

Schoolboy Matthew and his father, a chartered engineer, won a Brother 1709 printer supplied by Kelator, Acorn's distributor to the trade.

The 1709 can output text in three different modes and comes complete with software to make the most of the Archimedes' capabilities. It is worth £685.

Both winners also receive an impressive plaque in recognition of their achievement in the nationwide search for the most innovative use of Acorn machines in 1988.

"Quite simply, Hearsay is visually stunning and extremely effective."
"Beebug has done an excellent job. . ."
". . . Hearsay can be wholeheartedly recommended."

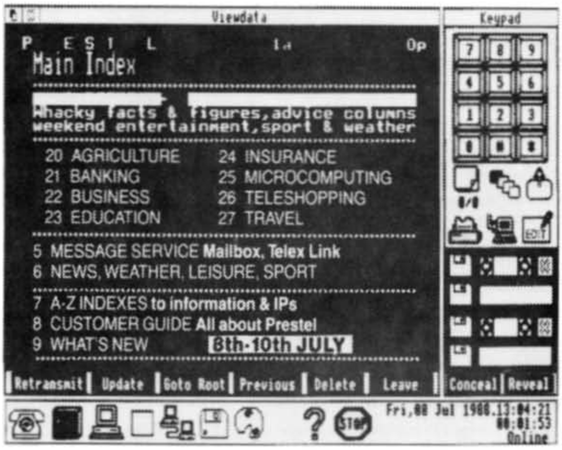
MICRONET Aug 1988

BEEBUG HEARSAY

FOR THE ARCHIMEDES

State of the Art Communications Software

Hearsay is an exciting new package taking communications on the Archimedes into a new league. Written specifically for the Archimedes, Hearsay makes full use of the WIMP environment making it very easy to use. It is ideal for use with Prestel, Telecom Gold and bulletin boards, and no technical knowledge is necessary. However, experienced users will find Hearsay packed with advanced features making it an indispensible tool.



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P  E S I  L              1a          0p
Main Index
.............................................
Whacky facts & figures,advice columns
weekend entertainment,sport & weather
.............................................
 20 AGRICULTURE       24 INSURANCE
 21 BANKING           25 MICROCOMPUTING
 22 BUSINESS          26 TELESHOPPING
 23 EDUCATION         27 TRAVEL
.............................................
5 MESSAGE SERVICE Mailbox, Telex Link
6 NEWS, WEATHER, LEISURE, SPORT
.............................................
7 A-Z INDEXES to information & IPs
8 CUSTOMER GUIDE All about Prestel
9 WHAT'S NEW          8th-10th JULY
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NEWS beat

More choice

ACORN users will soon be seeing the benefits of changes the company has made in its distribution policy. The brief for Hugh Symons, AB First and Kelator has been redefined, encouraging each company to sell into a wider spectrum of the market.

This gives dealers a wider choice on distribution and delivery, with obvious benefits for their customers.

On an informal agreement between the three distributors, Hugh Symons previously concentrated on the music and health markets because of its good record in these sectors.

But it was felt by Acorn that this was creating artificial barriers in its distribution network.

Under the new arrangement AB First and Kelator will both sell into music and health while Hugh Symons will be going into different areas.

"Symons came to us originally with the credentials that it had in the music market, selling a lot of Atari product into the specialised music stores", said Acorn's general sales manager Terry Sherwood. "It also had a lot of knowledge of the health market and contracts with the National Health Service.

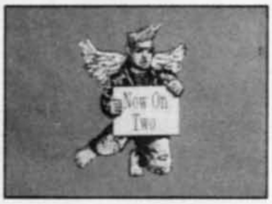
"It demonstrated considerable ability and we have decided to widen the brief and let it sell into other areas". These will include the education, science and government markets.

Arc to the rescue

SPIKE is the punk cherub cartoon character currently delighting children on the Sunday morning BBC 2 programme Now On Two.

But getting Spike to dance across the TV screens caused a headache for technicians at Television Centre. Eventually it was Acorn's Archimedes that came to the rescue.

"When we decided to present Now On Two with live links between childrens' TV programmes I wanted a cartoon character to be generated and appear on screen", explained producer Ian Stubbs.



"We went to the PC show and looked at a number of machines. The Amiga seemed to have the best software so we borrowed one. But the Workbench was so full of bugs it was driving us mad.

"We tried to create Spike with it for three weeks but with four days to go to the launch of the show we had got nowhere.

"Finally we bought an Archimedes and got the job done in time using a genlock board produced by BBC TV technicians to make the overlay work.

"With the Archimedes, we did in four days what we had not been able to do with the Amiga in three weeks".

Easier fax calls

MICROLINK subscribers have been spared the problems reported by users of Telecom Gold's new fax service Mailfax.

Because Mailfax bewildered many people, up to 30 per cent of messages were being addressed to invalid numbers.

But MicroLink (0625 878888) has come up with a simplified method for using the facility – called Easy Fax.

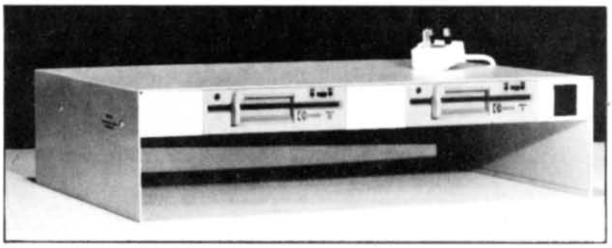
"People were being asked to key in all sorts of different sequences in order to send fax messages", said MicroLink systems manager Tim Clarkson. "Even I found Mailfax difficult to use.

"But we've re-written the front end of the program for our own subscribers – now all they need do is type in the telephone number of the fax machine they want to send their message to".

At the same time, MicroLink has introduced Fax Check – a method of seeing whether messages queued for transmission have been sent or not.

"The whole principal behind using electronic mail for faxing is to make it as easy to use as possible", said Derek Meakin, head of MicroLink.

"We feel that with Easy Fax and Fax Check as add-ons to the Telecom Gold fax gateway, we've managed to get it right for our subscribers".



Cumana's new disc drive

Low line disc drive

A LOW profile disc drive and bridge unit has been launched by Cumana (0483 503121).

The 5.25in system comes with power supply offering a choice of 200k 40 track double-sided, 400k 80 track double-sided switchable to 40 track mode, 400k 2x40 track double-sided, and 800k 2x80 track double-sided switchable to 40 track mode.

Three options in the 3.5in range are 400k 80 track double-sided, 800k 2x80 track double-sided and 400k 80 track double-sided without power supply.

The bridge unit houses a CB400 2x40 track double-sided system, price £233.91, and CB800S 2x80 track double-sided system switchable to 40 track mode, price £268.70.

Making music

FROM the Beatles to Bartok and Sting to Sibelius, desktop music making is an exciting and satisfying pastime.

Hybrid Technology (0223 316910) claims to have produced the most powerful music system ever created for a micro with its new Music 5000 Synthesiser Junior, the result of 10 years of development.

The package, for Model B or Master 128, consists of the 16 channel synthesiser unit, 32k rom module, disc and 48 page user guide and is priced at £99.

Also available is a Junior Software Pack for users who already own a Music 500 or Music 5000 priced at £69.

With a good range of high quality instrument sounds, the package gives users the power to create complete performances either from the example pieces of music supplied or straight from their imagination. Hybrid says that using its I6 channel sereo digital sound generator is child's play.

Other new products for BBC Micro music makers are five more Ample music album discs for the Music 5000 each at £4.95, bringing the total released on their 256-byte Records label to 10.

SOFTWARE AT BARGAIN PRICES

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XMAS OFFER

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Icarus	7.50	9.95
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VISA

MORE than 10,000 visitors packed London's New Horticultural Hall over the three days of the 20th Electron & BBC Micro User Show. With many new products launched and the chance to pick up pre-Christmas bargains the exhibition was voted a great success.

Now the UK's longest running user event, it attracted over 50 exhibitors. They used it as a platform for their BBC Micro and Electron range of products and also to highlight the Wonderful World of Archimedes.

Another main feature was the culmination of the nationwide search for the most unusual use of the BBC Micro. Finalists in the 1988 Micro User Innovation Awards had their ideas on display and all visitors had a chance to vote for their favourite. *(Results: See Page 7.)*

● ***Results: See Page 7.***

10,000 flock to the pre-Christmas show

HARROW-based Silicon Vision (01-422 2274) chose the show as its exhibition debut, and managing director Yunas Madiadi said he was delighted with the result.

With show visitors besieging his stand he said: "We had many new products and that is why we made the decision to come to the exhibition. It has been a useful place to allow people to have hands-on experience. Our advertisements claim the excellence of our products but it is difficult to explain that fully to people.

"We decided to use the show to prove at first hand how good they are. It is difficult for people from all over the country to visit us in Harrow but this exhibition is the ideal opportunity for them to come and see us. It has been a great success. People are buying".

Working for the Arc

CONFIDENCE in the Archimedes has paid off for Nova Fisher of Devon-based Minerva Software (0392 437756). Minerva has previously been producing software for the BBC Micro but when the Archimedes was launched she gave her full commitment to the new machine.

It was a brave stand taken at no little risk, but it has certainly brought dividends. So far Minerva has produced more than 20 pieces of software for the Archimedes and more are on the way. In the last 18 months staff at its Exeter headquarters has trebled.

Although Mrs. Fisher was away in Australasia her staff was showing five new products: Ancestry, for tracing genealogy in families; Reporter, a fully relational user-defined reporting package; Mailshot for producing mail merged letters and multiple labels and Jet Fighter, a space defence game.

Pres launches

AFTER working round the clock in the run-up to the show Surrey based Pres (0276 72046) produced two major launches: Advanced File Manager and Archimedes Utilities.

It has been working for a year on Advanced File Manager which Pres boss John Huddleston described as "the ultimate front end system for disc users". This current version of AFM, which has links to the advanced control panel, was finished within 24 hours of the show. The hard work paid off with a lot of customer interest.

"We think we have produced the major software contribution of the show for the Acorn range", said John. "The most powerful part of Advanced File Manager is its copy routines which allow the user to move files between different drives – DFS and ADFS – by highlighting filenames on screen".

Advanced File Manager follows the company's continuing masterplan of upwards compatibility. It runs on the Electron, BBC B, B+, B+128 and Compact with Second/Co-processors and Acorn compatible versions of DFS and ADFS.

And Pres has been allocated a special osword call by Acorn to allow easy access to other roms loading routines.

Archimedes Utilities is an inexpensive set of utilities to assist Archimedes users. It will display mode types and memory map and includes module interrogation and hard disc back-up.

"Response to both these products has been extremely favourable and it was well worth the last minute rush", said John. "It proves that if you produce the right goods the users will appreciate it. The public has also responded well to the re-release of the ACP range of software".

New DTP package

PRIDE of achievement was shining bright in the eyes of staff on the Watford Electronics (0923 50335) stand as it launched the result of 18 months' work – the new desktop publishing package Wapping Editor.

This program for the BBC Micro range was on show on the first day of the exhibition and on sale the following two days.

Wapping Editor is a mouse-driven desktop publishing package with a built-in word processor and Mode 0 version of the Mode 1 graphics package – Quest Paint.

"The massive 64k rom contains all the software you need to do your own publishing. It brings the freedom of the press to your fingertips", says Watford.

Supplied with it is a utility disc with 12 fonts, rom image and lots of extra facilities including pattern files for the graphics package and a routine which will convert any graphics screen into mode zero for easy importing of graphics from other packages.

There is a font editor to allow the user to design type faces. Typesetting includes micro spacing plus proportional space fonts.

And one of the most useful facets is the Expand option allowing type to be increased

NEWS *beat*

by micro spacing to fit bigger space. Wapping Editor works on the BBC B, B+ and Master.

Also new on the Watford Electronics stand was a 20Mb hard disc for the Archimedes.

"It is the first time it has been on show and it has been selling very well", said head of Watford Electronics, Nazir Jessa.

After mice – a rat

SEEING a mouse in action at a computer show is nothing unusual, but there can be few visitors who expected to see a rat.

Fortunately, not many people who turned up at the Armadillo Systems (0572 822499) stand caught sight of Ish, the brown and white rat that is the constant companion of Adam Wynne.

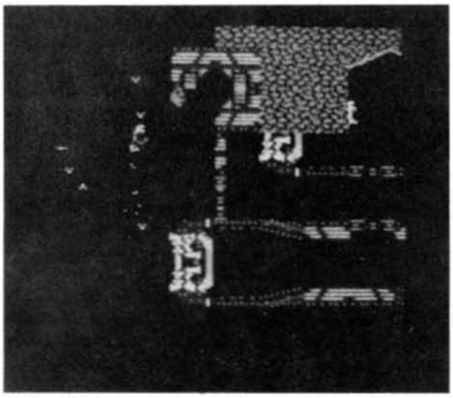
Adam runs Armadillo with his brother Mathias and father Milton and his furry companion spent most of the show curled up asleep inside his shirt.

Making its first visit to the show, Armadillo was displaying a trio of products for the Archimedes. Pride of place went to its A616, a 16 bit sound sampling package designed for the user who demands both performance and quality in software and hardware.

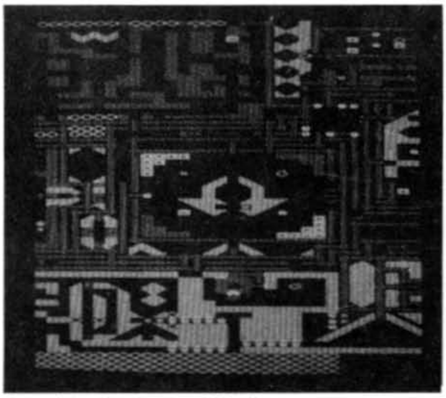
Also on show were Armadillo's A448b sound sampling package, an updated version of its 8 bit sampler and the company's transform module – Spectre Fourier analysis software.

"We wanted to get reaction to new lines", said Milton. "We thought the best way to do this was to see it sold. Market research does not do this and we feel that by coming to this exhibition we are doing market research in the true sense of the word.

"We want to establish a pattern of sales to rationalise our lines".



Exile: "The game you needn't promote"



One of the four levels of Pipeline

New games lined up

ON the games front Superior Software (0532 459453) launched five new releases at the Electron & BBC Micro User Show.

Top of the list was Exile, a massive arcade adventure which Superior sees as the biggest milestone since Elite.

"This was our biggest release for several years and the show was the first time that customers had a chance to buy it", said Steve Hanson of Superior.

"It has just taken off so quickly that we are finding it hard to keep up with demand. It seems to be one of those games that you just do not need to promote. We have even had people ringing dealers and distributors wanting to know how to get hold of it".

Steve said that Superior could have had the game out earlier but kept it back a couple of days so it could be officially launched at the show. It runs on both BBC Micro and Electron.

Second in the popularity polls at the Superior stand was Pipeline, which was given 10 out of 10 when reviewed in last month's issue of *The Micro User*.

An arcade adventure with four levels, Pipeline features connected pipeline complexes and comes complete with a games designer.

Also new at the show was Superior's boxing game By Fair Means Or Foul where the fighters can cheat if the referee is not watching. This is for BBC Micro, Master Compact and Electron.

Completing the Superior line-up were Play It Again Sam 2 and Play It Again Sam 3, two good selling four-game compilations.

Prior to the show, Superior had promised new releases each week on the run up to Christmas.

First of these was Last Ninja, a new slant on the martial arts game followed by Repton Infinity with four games and complete games designer and A Question Of Sport based on the popular TV series.

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Impact Games (0742 769950) launched two new games at the show: Clogger, the new arcade adventure, was "going like hot cakes", according to Steve Bottrell.

And its second new release for BBC Micro and Electron was Zennon, a sideways scrolling action arcade game with a daunting 25 levels giving the player a chance to blast all manner of nasty creatures.

Released just two weeks before the show, Quazer for the Archimedes attracted a lot of interest. It is a 12 level vertically scrolling arcade game with passwords at each level.

"The show was a great success for us and everything went very well", said Steve.

Although there were no new releases from Tynesoft (091 414 4611) it used the show to preview two games prior to general release.

Circus Games for BBC Micro and Electron gives players a chance to try their hand at tightrope walking, tiger training, trapeze and trick horseriding.

Superman is described by Tynesoft's David Croft as "the out and out arcade game" with Superman taking on all comers to save the world. As an added incentive to buyers everyone going for this game receives a free Superman T-shirt.

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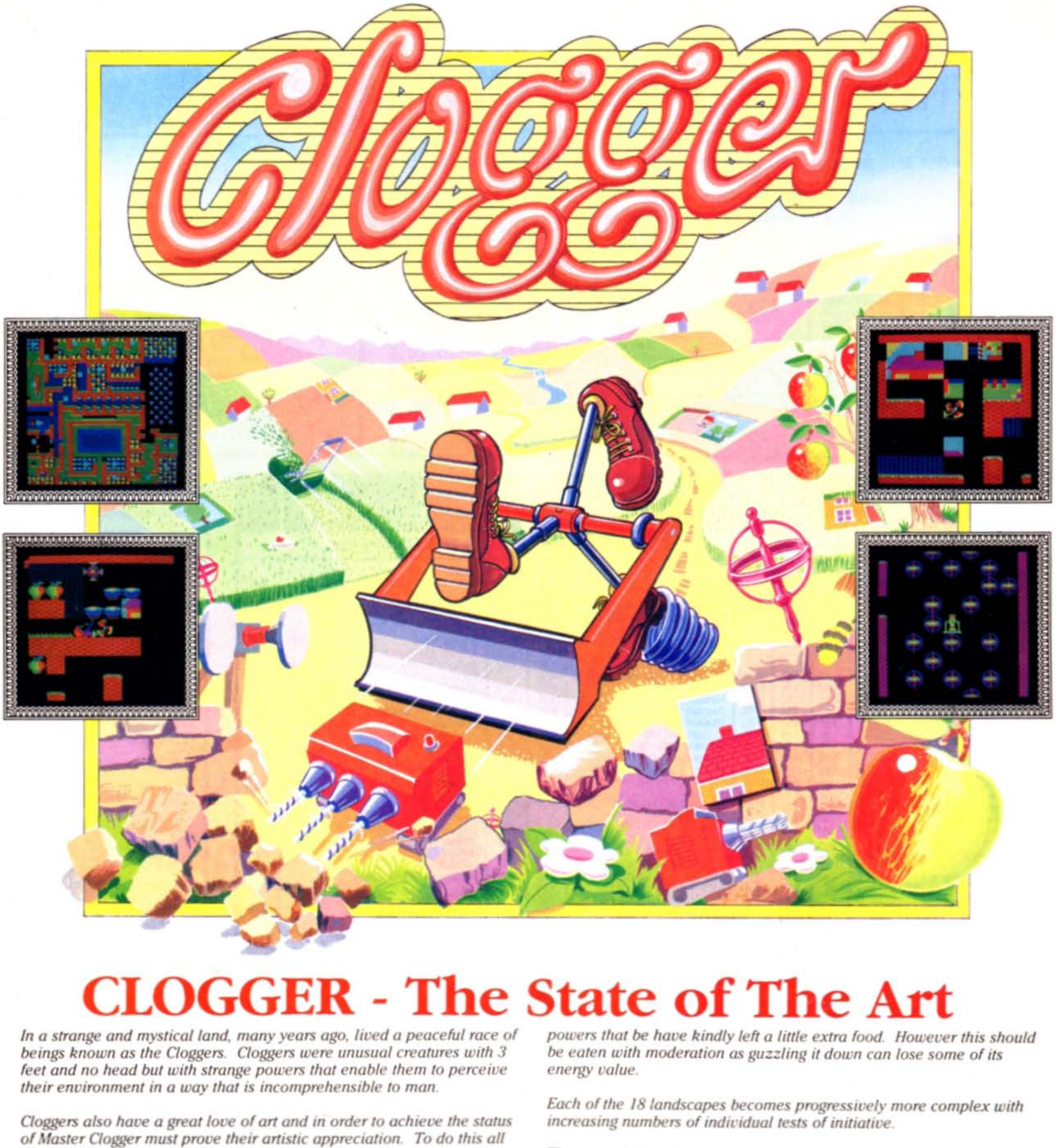

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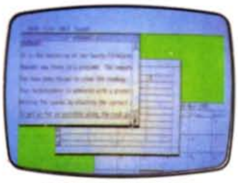
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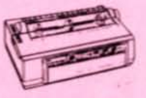

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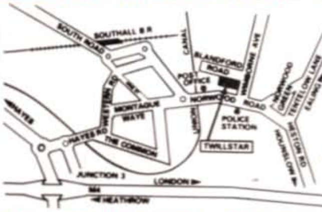

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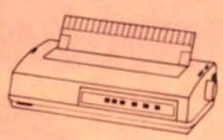

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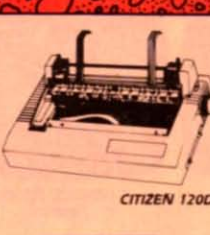

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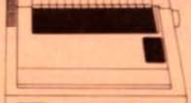

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THE Body Build Experimenter's Board was first described in the August 1988 issue of *The Micro User* and enables you to learn about interfacing in a painless way. It contains many components which can be interlinked to enable a wide variety of experiments to be performed. Last month we looked at one of the hidden goodies in the VIA, the shift register.

Unfortunately, due to space limitations the shift register simulation program will have to be held over until next month. Meanwhile let's look at the timers and see what we can do with them.

The VIA contains two timers named, with a staggering burst of creative imagination, as Timer 1 and Timer 2 and they occupy six address locations. Both are 16 bit counters split up into two byte address locations known as high order and low order. Despite this they act as if they were a full 16 bit register and their basic function is to count system clock pulses – the 1MHz clock – although Timer 2 can count pulses fed to it from outside.

The main point to remember is that both counters count down: Once you initialise one with a number it will be decremented until the counter reaches zero. What happens on reaching zero depends on which mode the timer is operating in – said modes being the key to understanding the timer's usefulness.

The timing could be performed by a software loop, but you would not get such fine control and you would have to disable any interrupt-driven background tasks and tie up the whole machine. With a separate hardware timer all you need to do is set it going and it will call you back when the time is up – definable in 1uS intervals.

Timer 1 occupies address locations &FE64 and &FE65 and, according to the convention used in the rest of the system, the higher address stores the most significant byte of the count. As the timer decrements with each 1MHz clock pulse – every 1uS – the number in these memory locations changes. When it reaches zero – or times out – we can have it stop, repeat the time period, produce an interrupt or an output signal. These modes are controlled by the auxiliary control register at address &FE6B and are summarised in Table I.

The first thing you have to decide is whether you want one-shot or continuous operation. As the name implies, one-shot operation will cease after the timer has timed out, whereas in the continuous mode the initial value is re-loaded into the counter automatically on time out. In order to do this the VIA has to store this initial value, doing so in the counter latches at address &FE66 and &FE67. If we load a number into them it will be used to re-load the counter upon time out.

The other decision you have to make with Timer 1 is whether you want an output, which appears on bit 7 of the B side of the input/output port. The output from the timer overrides any normal mode for this pin. If you want an output on time out, two types are available – bit 7 can go low for one clock period (1uS) or it can be made to invert the state on this line.

This latter state is perhaps the more interesting as it means that the VIA can generate a square wave of programmable frequency without any processor intervention. I used this to generate a clock signal in the radiation detector project – Body Build August 1986.

Let's use the Experimenter's Board to illustrate Timer 1's action. We can do this as part of a program, but also by direct commands from the keyboard. First of all we need to put the timer into the correct mode, in Basic:

```
?&FE6B=&C0
```

or in Forth:

```
HEX FE6B C0 C!
```

Now we need to load the timer with an appropriate number – we'll use a large number to give us a long delay, say &FFEE. Now we have to load this number into the latches and set the timer going. There is a special sequence in which to do this as the action of writing into some of the timer's locations also prompts the automatic transfer from latches to counters. Just load the least significant byte first into the counter and this will actually access the latches and then

Turn to Page 24 ►

Bit 7	Bit 6	Action
0	0	One-shot operation of Timer 1
0	1	Repeated time-outs
1	0	One-shot operation of Timer 1 with –VE going pulse on bit 7
1	1	Repeated time-outs bit 7 inverting every time.

Table I: Address &FE6B Timer 1 modes

Bit 5	Action
0	One-shot operation of Timer 2
1	One-shot operation of Timer 2 counted down from external signal

Table II: Address &FE6B Timer 2 modes

> *Timing could be performed in software but you would not get such fine control*

◀ *From Page 23*

write the most significant byte into the counter. This will again access the latch, transfer from latch to counter, and finally set the timer going. In Basic this is:

```
?&FE64=&EE
?&FE65=&FF
```

and in Forth:

```
FE64 EE C! FE65 FF C!
```

Now put link 3 into the B position which connects bit 7 of the user port to the LED and the audio amplifier. The LED will start flashing and the loudspeaker clicking. Every time the timer times out you will invert the signal, so the lamp will flash – by making one complete cycle – every two timer intervals. We can calculate the frequency by taking the reciprocal – one over – the time period. Hence we have a signal of 1/(&FFEE * 2) MHz which, when you work it out, it is about 7.6Hz and is about the lowest frequency we can get. Now let's increase the frequency by typing in:

```
?&FE65=2
```

or, if you're using Forth:

```
FE65 2 C!
```

You'll hear a high pitch tone and the LED will look as if it is permanently on. This is because it is flashing so rapidly that the persistence of vision makes it appear to be continuously illuminated.

Now let's perform another experiment: Change the number in FE65 to 30. The LED will still look permanently on but you will notice that the note has dropped. Now take hold of the board, look at the LED and rapidly shake it backwards and forwards. You will see that the LED appears to look like a series of dashes. This is because while it is on, the light from it is smeared across your field of vision, but when it is off there is no light and so you see a gap in the smear. Note too, as you change this number the smears grow longer or shorter – this is the basis of a stroboscope.

The important thing to note is that the output is being produced without any processor intervention once the registers have been loaded up. It is a simple matter to change these register values every now and again to produce a tune or a series of random tones.

● *Next month we'll look at the other timer and see how we can measure frequency.*

Ordering the board

The Body Build Experimenter's board in kit form – £60 – or ready assembled – £70 – is available from Musbury Consultants, 8 Fairhill, Helmshore, Rossendale, Lancs BB4 4JX. More details of individual component prices are in the September and November 1988 issues of *The Micro User*.

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CEEFAX Guide

B B+ M

Software is currently transmitted for a period of one week. Files are available from Friday afternoons to the following Thursday evening, with the exception of the Issues teachers' notes which, due to their topical nature, are available from the Wednesday morning to the following Tuesday evening during the week of transmission. The details are provisional only.

Dec 2 to Dec 8

T/SWR22 RFSgen
AutoRFS Demo

This module in the sideways ram programmers' guide looks at the rom filing system – an alternative to disc or tape – which can store programs and/or data there either permanently on an eprom or temporarily in the volatile sideways ram.

19870 19871 19872
19880 19881 19882

Data files to accompany the recently broadcast personal portfolio analyser based on the CEEFAX financial pages.

Font Fontinf
Example

Font is a comprehensive font designer, and will allow the redefinition of all the 255 available characters if you wish and these can be used by a second program. Full documentation and some general information on fonts is provided in the package.

T/MOU02 SPMouse

This week the series delving into the heart of the machine takes a close look at Tube compatible mouse software.

CodeCat

Solve simple replacement code algorithms using this clever program from the July 1988 issue of *The Micro User*.

Dec 9 to Dec 15

T/SWR23 AllRFS RFSgen
RFSHead Demo

T/SWR23 continues the study of sideways ram, and offers a more complex header for roms containing RFS software. Such a header is only required in one RFS rom, and includes extended HELP messages, an auto-boot feature and a new star command to run programs. Detailed instructions are included.

Globe Globe2

Sit for hours and watch the world go round with this very clever piece of animation, showing the BBC globe rotating. An intriguing demonstration of the BBC Micro's graphic display capabilities.

!Boot Echoes Ech/inf
Tokens Link Add
Vars Data Code

From the forefront of technical achievement comes the intelligent loader. This system simplifies the use of the DFS, making disc operation and house keeping easier to understand and implement.

T/MOU03 Event Buttons

The fourth in the series explaining how to get the most from your mouse. This week looks at two ways of reading the mouse buttons.

MicroWorks

Now you can design superb Mode 4 screens using this excellent program from the October 1987 issue of *The Micro User*.

Dec 16 to Dec 29

T/SWR24 Modone Modtwo
RFSgen Demo

A look at how to overcome the problems of assembling 16k or more code residing in sideways ram when the BBC Micro leaves as little as 8.75k for the source code.

Noelboot Noel1 Noel2
Noel2M Noel3 Noel4
Noel5

Bring a little Christmas cheer to your friends with this highly seasonal, demonstration program. Noel is a musical christmas card from BBC Telesoftware. Select tunes from a variety of carols and watch the colours of the scene change.

Combat1 Combat2 CZins

Become a General in this colourful, multi-player wargame. Attempt to capture the *stormlands* by whatever means before your enemies get there. Four types of army are at your command: Goblins, Orcs, Elves and Humans – all with different characteristics.

T/MOU04 Newkeys Newscan
Loader

More from the series enabling easier mouse communication. This, the fifth module in the present series, examines the use of the negative INKEY and the keyboard scan to read the mouse.

SSTrade

Step back in time and become the captain of a trading ship sailing the South China seas. This one player game involves a lot of skill as you trade your way from port to port trying to make your fortune.

Colites

Do some physics revision and learn how colours in light can be added together with a simple but effective jaunt into the world of GCOL. From the October 1986 issue of *The Micro User*.

Dec 30 to Jan 6

T/SWR25

The concluding part of the series explaining the mysteries of sideways ram offers a comprehensive index to all 24 modules.

T/MOU05 Anmouse

In the sixth module of the series designed to familiarise you with mice we investigate yet another way of reading values. The use of the ADVAL command from the onboard analogue to digital converter is examined in some detail.

PS/Info Alph Indel
WDF SetUp

Here's a database specifically written to help disc users keep track of the type and content of all the files held on an assortment of discs. A comprehensive information file is included.

Midas

This imaginative game places you in the position of seeking gold. Not any old gold, but the family treasure left to you by a kind relative. Unfortunately, to avoid legal complications it has been deposited in various bank accounts around the country and your job is to recover it.

Tinkles

Explore sound and light with this fascinating project from the September 1988 issue of *The Micro User*.

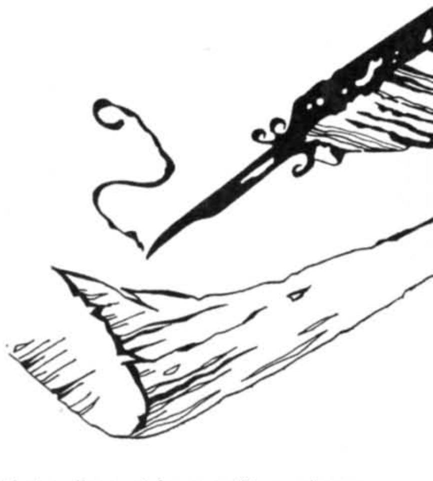
Offer

If you can't receive Ceefax on your BBC Micro why not take advantage of our Morley Teletext adapter offer on Page 141.

B B+ M

More solutions to your adventure problems from the Mad Hatter

Larsen lays down



I FEEL so smug: In fact I think my portrait ought to be re-drawn again – I am now the proud and loving possessor of an Archimedes 310M, colour monitor and all. However, enough of *my* bliss: Wedding bells have claimed another happy victim – adventure-writing craftsman Geoff Larsen. This, naturally, means that Geoff will have little spare time – and just about none for creating adventures.

His current list of games will continue to be available but, regretfully, we can expect no more products from the Larsoft stable. Since Geoff's adventures are just about the best quilled games around for the BBC Micro, I suggest you complete your collections while he still has a little time to duplicate cassettes and entrust them to the postman.

Geoff's new address is 26 Oakfield Grove, Clifton, Bristol BS8 2BL and if you write and ask him nicely, you may still be able to get advice and answers to puzzles in his games. However, as a backup system, Geoff is letting me have definitive solutions to each of his adventures. I'm sure readers will join me in wishing Geoff and Rita all the very best for their future life together.

Other news – of an equally pleasant but different kind – comes from Topoligika. My spies tell me that two new adventures are in the offing: If all goes well they'll be released fairly early in the New Year.

Avon has a Shakespearean flavour, using the talents of Jonathan (Kingdom of Hamil) Partington and **Spycatcher** is based on something-or-other that we've all heard a lot about in 1988.

Conversions of all the Topologika adventures to Archimedes format can also be expected fairly soon. Meanwhile, readers might like to be reminded that a discount for quantity purchases of their reissued adventures is on offer: Single adventures cost £9.95 each, two are £15, three £20 and all four – **Philosopher's Quest, Countdown to Doom, Kingdom of Hamil** and **Acheton** – cost just £22 from Topoligika, P.O. Box 39, Stilton, Peterborough, PE7 3RL.

To the best of my knowledge **Return to Doom** – see my review in the September issue – is still £12.95 and the price of the new games hasn't yet been decided.

Into the Twin Kingdom

I AM sometimes – with complete justification – accused by readers of this august column of being slow to fulfil my promises. A passing moment of madness, a new adventure released into the market, the desire to achieve something of a balance of material in the column – all conspire to delay the time when I can reveal the secrets of adventures that have long bedevilled and frustrated you.

*Thus only now can we take a filleting knife to the Bug Byte adventure **Twin Kingdom Valley**, which took a whole new lease of life as a budget-priced reissue two years ago.*

In essence, you have to explore two rival kingdoms which occupy the same large valley area, collecting treasures, overcoming opponents, solving puzzles and hoping above all to gain the maximum 1,024 points that the game awards.

It is important to realise early on that you need to ally yourself to the Forest King and mount a one-person SAS expedition to the Desert King's Castle.

I am grateful to Stuart Booth, Alisdair Jorgensen and Richard Entwistle for providing the maps and solutions I have used to check my own material.

The start of Twin Kingdom Valley has all the features of a good game for beginners. There is a cabin for storing your treasures and plenty of places to visit before too much happens that is difficult.

Take the jug, the brass key and the lamp from the cabin, and head for the quarry. There you will find the Flint that enables you to light the lamp.

Next, locate the locked brass grating in the clearing and unlock it. When you have done that, fill the jug with water from the stream and take a drink.

Thirst is the main hazard which can catch the unwary – other dangers are obvious. Therefore

What the L?

So many readers have written in about problems in the mathemagical adventure **L**, that over the next few issues I am going to serialise the solution sent in by Bill Hensman. I shan't give all the answers, though I'll indicate how Bill suggests they may be found. As he says: There are many false trails and useless bits of information in this adventure, but it is excellent for maths pupils as even the false trails cause them to look up bits of mathematical information.

On first starting the game it is worth asking for help when prompted. After that follow the abbott, noting which way he goes, until he offers you advice before vanishing. Although the store room where this happens has climable shelves, there's not much point in doing so. Instead you should go W to the old kitchen and W again to the workshop.

Don't take the tetrahedron yet, instead move W to a passage, N to its end and then E to the telephone room. Have fun dialling for messages by all means, but the vital thing to do here is PUSH CHEST to reveal the ladder leading Down.

Those who enjoy mazes might like to gather enough objects to map it themselves – I'll hold the solution over until next month. Meanwhile, when you descend the ladder, you receive a warning about the drogo guards which are encountered at random after this point in the game. They can be frightened off by quickly typing in the square root of their identity number – which is always a perfect square. If you are foolish enough to get captured you'll have to wait until the last instalment of this solution to find out how to escape.

Towards the Dungeon exit

Last month's section on **Dungeon Adventure** left you sitting on the Throne, wearing the Mithril Collar and feeling pleased as punch. Since the throne counts as a pedestal, enter *orange* to teleport to the pedestal of that colour and climb down.

Now go NE to the lower chamber and then to the upper one. Kill the dragon with the sword, and make sure that you explore the area thoroughly. Collect the wand, staff, chair, bed and teeth as you do so. Put these into the packing case and return to the orange pillar. Enter *Yellow* to teleport to the prison area. Get the sliver (rancid chip) and the pot from the cells and the jar of cold cream from the walk-in cupboard and the nails from the toolroom.

Go E from the jelly cavern until the rat is scared off by the rancid chip, drop it and get the pendant from the rat's nest. Return to the jelly cavern and go up the chimney. Then you must rub the cold cream all over yourself so that you can enter the fire elemental's alcove and take the medallion.

Return to the jelly cavern, go N twice and fill the pot with slime. Now return to the yellow pedestal and enter *Blue* to teleport to the Wight House. Make sure you are carrying both the cross and the crucifix here, and go S and S to the crypt. Close the coffin with the hammer and nails, then take the trident. It's now time to deal with that beligerent goat. Leave the Wight House and drop the slime-filled pot beside the goat and you'll now be able to take the horn safely.

Next you must go Up the stairs to the gully above the winding stairs where the dwarf was seen to disappear – see last month's column. Move N from here and take the ore. Now store the pendant, medallion, trident, cross, crucifix and horn in the packing case. You can also abandon the hammer now if you didn't leave it by the

Turn to Page 29 ▶

you should make it a policy to keep the jug handy and drink from it the moment you are told that you feel dry. Refill the jug as soon as possible after you've emptied it.

Now you must arm yourself against enemies – gorillas, trolls, guards and sand lurkers. Head for the canyon, where you will usually find an elf carrying an axe. This is the most powerful weapon, and – since the elf is friendly – he will give it to you if you ask.

After that, go West to Watersmeet and both drink and swim there. Drinking opens your eyes to all sorts of possibilities – well, secret doors anyway – and swimming has a powerful restorative action.

If you are ever badly hurt, keeping on the move helps you to recover slowly, but should Watersmeet be not too far away, I'd prescribe a swim.

● Next month, now that you are ready for action, we'll get started into the adventure proper.

Elite success

My treatment of the Second Mission in *Elite* has been further delayed. I played right through from scratch and became Elite yet again without encountering the mission, so I'm now playing it in normal BBC B configuration.

It's only taken a couple of evenings to see off the First Mission, so I hope to produce a report for frustrated traders shortly. Combat is much easier without the Second Processor to speed things up.

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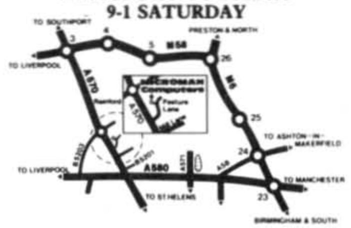

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◀ *From Page 27*

coffin. Go D from the first aqueduct to the ledge, eat the mushroom and cross the bridge, giving the Troll the ore.

Go N to the ledge where you have the message *You keep bumping into things that you can't see* and eat the invisible mushrooms. Enter the troll's store and take the spices and ore before you lose your invisibility. Now go D from the second ledge and eat the small mushrooms so that you are enabled to go back up and through the fissure to the north and into the strongroom.

Undo the bolt, take the chest and return to the cavern floor with the small mushrooms. Drop the chest, cross the floor and eat from the large mushroom return and eat the small mushrooms then last of all eat from the large mushroom once again. Now pick up all the dropped items and go up and up again from the Golden Bridge.

● *Conclusion next month.*

Hall of Fame

Congratulations and thanks to Jonathon Lee for solutions to The Hulk and Time Machine.

Comedy of errors

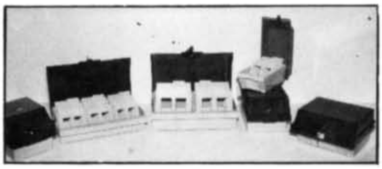
The second Muse that you need to help in **The Puppet Man** by Geoff Larsen is Thalia, the Muse of Comedy. She needs to be able to inspire Tomaszewski the clown who has mislaid his eggshell-face identity and so can't perform.

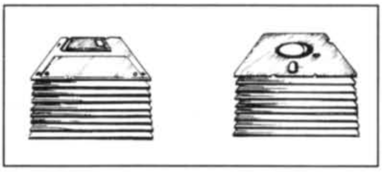
Go to the Manor House once more and enter it. Now go S and examine the table to find the salmon and take it – incidentally I'm amazed at the number of readers who didn't realise that bears adore salmon. Next go upstairs and move North, examining the shelf to discover the glove. Now you can leave the Manor House with your booty and go W,W and N to get the cleaver.

Return to the marquee and enter the ring. Open the cage, go in and drop the salmon and then leave. After this, open the cage, move N and E then drop the ladder and climb it. Open the cage, go back Down and W, enter the marquee again and close the cage to shut the bear up safely.

Now you must return N and E, enter the cage and examine the box to get the netting. Now leave the cage, go W and enter the marquee then go S, S, W, S, S, S, S and E to throw the netting. Go E again and use the cleaver to cut the chain, then enter the building climb Up, examine the nest and get the eggshell.

Lastly, return to the marquee once more and enter the ring – go N, W and Up, give the man the eggshell and climb down ready for the final part of the quest.





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The land of Shades

by someone who has been there and survived

I AM Whirlwind: I have been sent to tell you of Shades, a wide land wherin lies great treasure – and great danger too, if you wander around with your eyes closed and no thought of any worth in your head.

To start you must know how to enter the land. When you first play, you will have neither rank, honour nor any points. You will be a Novice and utterly useless. Therefore speak sweetly to others, and do not puff up with boasting, and maybe they will help you.

But if they will not, you had better know how to get around and get treasure. You can move in many ways by typing GO NORTH, GO UP, GO SOUTHWEST and all other directions. But you can also enter N, U and SW, which is quicker. OUT works from nearly everywhere and is good for retracing your steps if you get lost.

At first you will wish to stop and gawp at the wondrous things, and truly the descriptions of locations in Shades are lengthy and full of interesting information and clues.

But if you type BRIEF you will see only the name of your current location – you can see a full description by typing LOOK instead. This is useful, for you will move around quicker, and not have to cope with lots of words on your screen when you have to run fast from evil fighters such as Minotaur, whose name is a byword for cutting people into small bits.

When you find an object you must pick it up: So type GET (object). Not all objects are valuable: If you type GET T (for treasure) that is a quick way to tell if the object is worth anything. Then when you have it, type VALUE (object) to find its worth. Take it to the Mad King's Room, where if you drop it you will be given points for your deed, and may presently advance in rank and power.

The Mad King's Room is to the east of the courtyard in the castle, so you will not miss it. But if the drawbridge is raised you may not enter. Therefore go south from the drawbridge and you will find a way of lowering it.

That is all I can tell you for now, but I will return in the cycle of a moon and speak on matters of glory and honour: How to make a name for yourself in battle, unlike the fool Murrough, who sitteth in a safe place always and never dares risk his unlovely skin.

Until then, may the goddess protect you.

How to access Shades using your micro, a modem and a telephone line:

MicroLink/Telecom Gold......... key >Shades
Micronet/Prestel ....key * Shades #

The opening location in Shades

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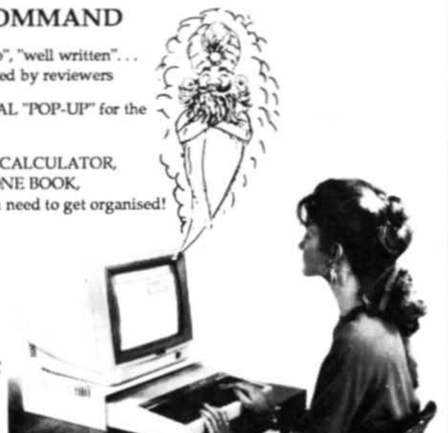

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SOFTWARE SCENE

Exile ... the new masterpiece

Price: £9.99 (tape) £11.99 (disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532 459453

THE Pericles was on her 500th tour of duty, her mission – to seek out new planets and boldly go where no man has gone before. Unfortunately, they weren't the first human visitors to the planet Phoebus. Fifty years before their arrival Triax, a psychotic genetic engineer, crash landed on this planet inhabited by imps and maggots ... and continued his warped experiments.

You play the role of Finn, the Dirty Harry of the Columbus Force, who has been assigned to investigate the mysterious events on Phoebus. Your objectives are to overpower Triax and destroy his mutant maggot production line before they set course for Earth and wreak their revenge on mankind.

A well-written novella graphically depicts the gory demise of each member of the Pericles' crew, but provides no major clues to aid the player as he pits wits and reflexes against this, the arcade/adventure to beat them all.

Due to the size of the game, the vital save options are handled by the initial loader program which provides all of the usual facilities that you would expect from a top notch adventure.

The story begins as you enter geostationary orbit above the planet Phoebus. Behind you a green spectral figure materialises momentarily then vanishes. Minutes later you discover that your ship's Destinator has disappeared and without it your craft is useless.

Donning space suit and jet pack you prepare to jump to the surface below, if only you could unlock the ship's hatch. A brief exploration of the cabin reveals the presence of a switch which, when kicked, unlocks it.

Stepping out into the blackness you fall gently on to a cross-sectional view of the abandoned Pericles. Several useful looking items can be seen inside the ship, but every hatch is locked and there are no handy switches nearby.

Leaping from the ship to the ground you wander towards an opening. But as you approach, a hamburger-shaped device attached to the underside of the ship swivels around and bowls you over with a few well-placed blasts from its stun gun.

At this point you decide that it would probably be safer to explore the planet's surface instead. Heading in an easterly direction you catch a few tantalising glimpses of goodies beneath the ground – courtesy of the cross-sectional viewpoint.

On the surface is a small bush, home of the most irritating canary that you've ever encountered. This feathered foe isn't harmful, but it follows you everywhere pushing you down holes and into the firing line of the trigger-happy hamburger.

With experience I discovered that you could pass the bird undetected by flying at altitude and landing on the far side. Here, hidden in a bush, you discover your first hand grenade.

Returning to the ship you decide to take your chances against the Big Mac blaster. Running towards the pit you suffer several hits, but manage to leap into the abyss and thrust out of range, only to find your way barred by a locked door. Remembering your grenade you drop it on the door, run to one side, and lay flat on the ground – this evasive action is most important as you'll be caught by the blast if you remain standing. The beeps of the primed grenade are followed by a bang and an open gateway to the underworld.

Thanks to the in-built intelligence of your spacesuit, death is an infrequent occurrence. Whenever it feels that your lifeforce is dangerously low it teleports you back to a previously chosen position – if you haven't remembered a position you are returned to your ship. Remembering is something that should be done every time you find a safe, alien-free, area of cave. By pressing *R* you can store up to four separate locations in your suit's memory.

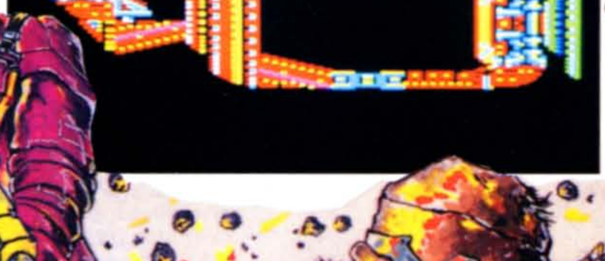
The caverns of Phoebus are home to a wide variety of imps, maggots, wasps, birds and an impressive selection of robots, many of which are armed with homing missiles. In addition there are natural barriers such as strong winds, water and inertia.

Exile's detailed graphics enhance the game's infuriating puzzles beautifully. Everything is drawn on a small scale, thereby emphasising the vastness of the underground complex. The animation is fast and incredibly realistic – I marvelled at the way Finn was bundled head over heels by a blast from the stun cannon. The atmosphere is heightened further by the stunning sound effects and screams of the injured Finn as he crashes to the ground.

Many years ago Micro Power released something similar with its Doctor Who program – it had the complex puzzles but failed miserably in the graphics and playability department. Exile suffers no such drawbacks – this is *the* arcade/adventure for the BBC Micro.

Jon Revis

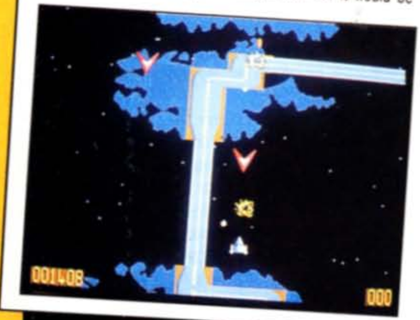
Sound	*10*
Graphics	*10*
Playability	*10*
Value for money	*10*
Overall	*10*



Quazer ... blast into infinity

Price: £11.95
Product: Impact Software, Neepsend House, 1 Percy Street, Sheffield S3 8AU.
Tel: 0742 769950

QUAZER seemed a strange name for a new Archimedes game, so a short trip to the dictionary was called for. Lots of words begin with the letter Q – far more than I would have thought. From quaver to quean – an archaic world for a bold girl – but no quazer. Perhaps Impact has mispelt it – after all they spell parallax as parellax on their cover notes – so, in desperation, I called them and discovered that it's named after a particularly enjoyable fairground ride. It would be difficult to buy this program without realising its genre. The packaging has a bright, almost gaudy picture of the game – a *blast'em all out of the sky* one. The notes on the package give you the background, as do the opening screens accompanied by excellent music which can be turned down by stages or switched off altogether.



Vertically scrolling Quazer reminds me of a very frantic version of Zalaga. If you enjoy games that give you virtually no time to think and are a non-stop onslaught of further terrors, this is for you. The Werros – the baddies – come at you in waves and for some reason as well as blasting them you have to shoot some red diamond shapes. What else could you do to these awesome Werros?

The power of the Archimedes is used to produce some stunning effects, and the programming is perfectly adequate. Quazer has one major flaw – clever graphics and multitudinous colour cannot create real excitement. Just hold down the fire button and blast away. One disquieting effect – when a sprite passes over a background of the same colour it becomes virtually invisible.

There are 11 levels each more frenetic and difficult than the last, but they do not get more interesting or addictive. The great variety of gaily coloured targets is a delight and I suppose that as the attacks follow a pattern, the thinking part of the game is to position one's ship so that the enemy may be destroyed as efficiently as possible. There is nowhere to hide from the kamikaze Werros and at higher levels more than one hit from the mega-photon-destroyall-torpedo (their description) may be needed.

QUAZER
IMPACT Software
Archimedes

There is a password system, so you can always jump directly to any level but you have to complete the previous level to be given the secret. A practice mode, which could be entered at any level, would have been a nice additional facility. A lot of work has gone into this game and it is at least as good as the opposition.

Peter Blenkinsop

Sound	*7*
Graphics	*8*
Playability	*7*
Value for money	*8*
Overall	*7*

Play It Again Sam 3 ... more great games

Price: £9.95 (tape), £11.95 (5.25in disc), £14.95 (Compact 3.5in disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds, LS7 1AX.
Tel: 0532 459453

SAM 3 includes two games that did not originate from the Superior stable: Elite's Commando and Micro Power's Killer Gorilla. **Commando** is the officially licensed home computer version of the arcade-machine game of the same name. For the information of anyone who has not ventured into an amusement arcade in the last few years, or who missed the game on its initial release for the BBC Micro, Commando is another of the one-man-against-the-odds combat games that have become so popular in recent years.

You are Super Joe, the commando of the title. Armed only with a submachine gun and half a dozen grenades, you must penetrate the enemy defences and destroy the fortress. Easy to say, hard to accomplish.

Like Tynesoft's Saigon, which I reviewed in the July 1988 issue of *The Micro User*, Commando features a number of different screens. Once you have fought your way from the bottom of one to the top, it scrolls vertically down to reveal a new screenful of hazards.

This re-released Commando incorporates one key improvement on the original: When playing that you sometimes could not determine from the screen display when you had been killed. Now there is no doubt: A blinding white flash heralds your call-up to the ranks of the ex-commandos.

I have never been particularly impressed by the BBC Micro version of Commando. Its main drawback is that it comes off very badly from the dilemma that faces every BBC Micro programmer – weighing up the pros and cons of each screen mode and the conflicting features of screen resolution, screen size and available number of colours.

Commando runs in Mode 5, which allows only four colours on screen and I found that many graphic features tended to merge into one another.

Although I get the impression that battlefields are pretty drab places, with the same four colours Saigon seems to generate an impression of far greater vibrancy than does Commando. Nevertheless, if you're a fan of shoot-anything-that-moves games, you could do worse than Commando.

Killer Gorilla will need little introduction to the majority of BBC Micro owners. It is an excellent implementation of the ever-popular arcade machine game Donkey Kong. Although released in the relatively early days of the BBC Micro, I have never seen another version that surpasses it in quality and playability. When an officially licensed version did the rounds of the popular home computers a few years ago, I was interested to see that no BBC Micro version ever appeared: Killer Gorilla got it right first time.

You play Mario, a humble carpenter. The evil Kong has carried off your girlfriend, to the top of an unsteady tower of scaffolding. You have to climb the tower to rescue her.

The game features four screens, each more difficult than the last. The first is a straight climb from the bottom to the top and the second introduces conveyer belts that keep changing direction. The third features lifts, made up of pieces of girder, and bouncing girders that can quickly cut down an inattentive carpenter.

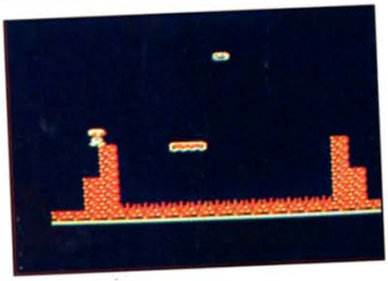
The final screen looks perfectly straightforward, but is rapidly overrun with deadly fireballs. However, it also includes two hammers and if you can reach them in time they will make short work of your fiery adversaries.

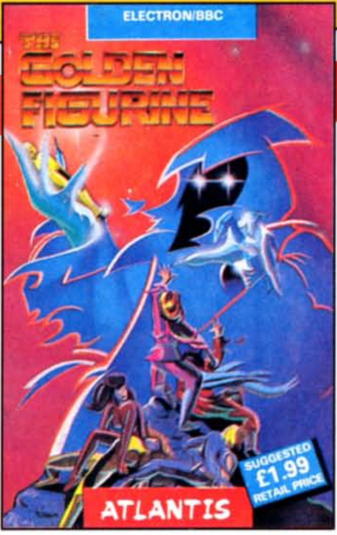
After you have completed this level and defeated the gorilla, you return to the first screen to find that things have changed, for the worse.

There are now gaps in the framework of the girders – so jump for your life. The conveyers on screen two move more quickly than before, as do the lifts on screen three. In all, the

The Golden Figurine ... addictive quest

Price: £1.99 (tape)
Supplier: Atlantis Software, 28 Station Road, London SE25 5AG.
Tel: 01-771 8642





TAKE a portion of Citadel and mix it with a touch of Jet Set Willy and you end up with the latest, budget priced arcade adventure from Atlantis.

The rules are simple: You take the part of the youngest son whose aim is to recover the golden figurine, a family heirloom, which has been stolen by the evil wizard Morthond. The game controls are left, right and jump and these suffice to get you around the 57 rooms of the wizard's castle, picking up and using objects as you go.

The castle is populated by the mutant servants of Morthond and these move around the rooms. Bumping into them will reduce your strength, as will collisions with spikes or water. Your energy can be replenished by using the items of food which have been left scattered about the castle.

If you manage to keep up your strength you will have to cope with the problem-solving parts of the game. Without giving too much away, you will need to find something hot to melt the snowman that blocks your path and don't try to use a boat while it has a leaky hull. The trampoline will have a number of uses, but great care will be needed to do things in the correct order.

Experienced arcade adventurers will not find these puzzles too much to cope with – in fact they could be an ideal introduction for the novice.

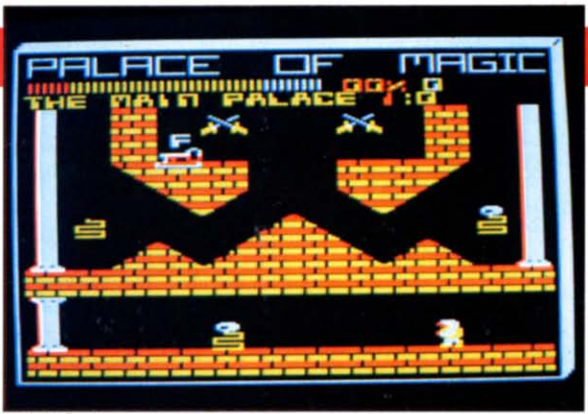
The skills of timing needed to prevent loss of strength present much more of a problem, because your character has incredibly fast movement. This leads to the one major snag – there are many places where one false move causes you to fall into a pit from which there is no escape.

Death comes quickly in these cases, and I would have liked a Citadel-like routine which moved you to comparative safety. To get the *You Have failed in Your Quest* message after a long session of adventuring is a bit too frustrating.

Despite that one criticism, Golden Figurine is addictive and fun to play. It is well worth getting for your Christmas stocking.

Rog Frost

Sound	***7***
Graphics	***8***
Playability	***9***
Value for money	***10***
Overall	***9***



Inside the Palace

3

game has 15 increasingly difficult levels – enough to test even the most ardent hero.

Killer Gorilla II is a BBC Micro version of the arcade follow-up, Donkey Kong Junior. Older games players may remember the original release under the name of Zany Kong Junior. Unfortunately that had to be withdrawn for copyright reasons – I suspect that it was too good a copy of the arcade original.

In Killer Gorilla II the roles have been completely reversed: Mario – now called Morris – has defeated Kong and rescued his girlfriend. However, in an act of revenge he has captured Kong and you – Kong Junior – must rescue your elder.

The game features four different screens that repeat with increased difficulty. However, unlike the first Killer Gorilla, the four screens do not follow a consistent theme.

The first requires you to swing around a network of vines bridged by brick platforms. Unfortunately, as usual, the screen is far from deserted.

The second level is completely different. The only way to reach the trailing chains way out of reach above your head is to bounce on a spring just in front of you.

The third screen depicts the generator room where you must scramble along electrical cables, avoiding the high-voltage sparks that race around the circuit. This can be very difficult because so many sparks are speeding in different directions that even a small gorilla cannot evade them for long.

When you finally reach the fourth level you look up to see Kong Senior's cage sitting on a girder held in place by six ropes high above your head. Six keys are attached to the chains hanging from the girder – collect them all to release your parent.

However, you must now contend with both the snapping heads from the first screen and the giant parrots from the second. As in Killer Gorilla I, once you have completed this you are returned to screen one with increased difficulty and must perform your feats of heroism all over again.

The last title in the collection is **Palace of Magic**, one of my good lady's all-time favourite games. It is an arcade-adventure with more than 100 screens, very similar in appearance to Superior's classic Citadel.

Palace of Magic does not attempt to disguise the source of its inspiration – quite the reverse in fact: You have offended the evil wizard Caldeti – try rearranging the letters – who has shrunk you to the size of a dwarf and imprisoned you in the Palace of Magic.

The complete map is very large and the solution to a particular problem often lies at the opposite extreme to the problem itself, so it's essential to draw a map and plan ahead.

One detail that caused minor problems on the game's initial release is that the screen goes black when you venture down a certain ladder – you've entered the palace dungeons. Don't be put off.

If you like games that require a combination of logical thought and manual dexterity, then Palace of Magic will certainly provide a considerable test to both skills.

Hac-Man

Sound	***9***
Graphics	***9***
Playability	***9***
Value for money	***9***
Overall	***9***

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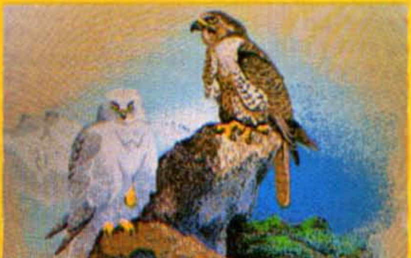

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ACORN USER February 1988

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RISC USER November 1987

deserving of special mention is a facility called Magic Brush... a true cut and paste... '**ARTISAN**' wins hands down.

ARCHIVE February 1988

ARTISAN represents excellent value for money... superbly designed pop up menus... very friendly, foolproof and quick to use... incredibly easy to use... Instantly appealing... superb features...the Magic Pen is unique to **ARTISAN**... Quantel would have been justified in getting a little upset... well organised...

A & B December 1987 & January 1988

ARTISAN SUPPORT DISC £19.95

Enhance the power of **ARTISAN** with this support disc containing many useful new utilities plus additional screens and fonts. Features include:

***DISPLAY** module to create your own slide show' with 8 standard or user defined fades. The fades are used to merge one picture into another just like TV. You control the speed of the merge and you can even design your own fades with the supplied definer.

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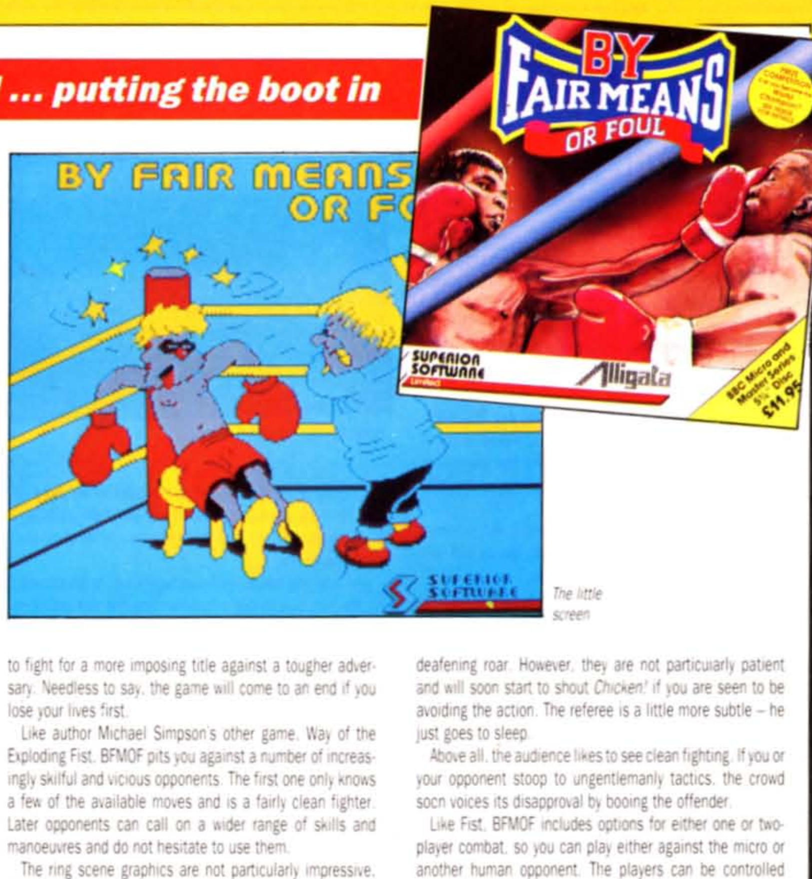
All the utilities work with any Mode 12 screen and so you are not limited to **ARTISAN** screens.

By Fair Means or Foul ... putting the boot in

Price: £9.95 (tape), £11.95 (5.25in disc), £14.95 (Compact 3.5in disc)
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532 459453



The little screen

LIKE The Big K.O. and the various karate games that have appeared on the BBC Micro, BFMOF allows the player to execute a variety of boxing moves. These include a body blow, uppercut, standard punch and duck punch – all perfectly legal boxing manoeuvres.

You can also move backwards and forwards and block your opponent's blows by engaging either a high or low guard. Four foul moves are also permitted – a head butt, knee kick and groin punch – hence the name of the game.

Of course, like any boxing match, the fights in BFMOF are supervised by a referee, who will try to ensure a good clean fight. However, there are times when his attention wanders.

So if you want to play dirty, strike quickly. The probability of executing a foul move without attracting the referee's attention is indicated by the colour of a silhouette below your score.

If the figure is red, you will certainly be spotted by the referee, orange indicates that you stand a reasonable chance of getting away with a foul move. A green silhouette indicates that any dirty move will certainly not be seen.

The referee's attention is constantly changing, so he may be watching one competitor with an eagle eye while the other may be able to execute all kinds of ungentlemanly moves.

You start off with five lives but will lose one if you are caught attempting an illegal move.

Each player has an energy level which falls every time his opponent lands a punch. If it reaches zero he will lose a life. Your energy does build up gradually as you regain your strength, but you will have difficulty in avoiding your opponent for any great length of time. However your energy is restored to maximum at the end of each round, so you can sometimes hang on to fight another day.

Rounds are one minute long, but the time can seem to go very quickly if you are losing. If neither player manages a knockout, the one with the higher energy level at the end of the round is the winner and the defeated player loses a life.

If you manage to defeat your opponent five times you go on to fight for a more imposing title against a tougher adversary. Needless to say, the game will come to an end if you lose your lives first.

Like author Michael Simpson's other game, Way of the Exploding Fist, BFMOF pits you against a number of increasingly skilful and vicious opponents. The first one only knows a few of the available moves and is a fairly clean fighter. Later opponents can call on a wider range of skills and manoeuvres and do not hesitate to use them.

The ring scene graphics are not particularly impressive, and the overall impression is of a game rather devoid of colour – a stark contrast to Exploding Fist. However, the animation of the two boxers is very lifelike as they swing their arms and jump around on their toes.

Another nice touch is the way that a board showing the number of the current round drops gently down from the top of the screen.

The crowd certainly believes in audience participation and if you manage to land a punch a little *Get him!* or *Again!* speech bubble appears in the air behind you. If you succeed in winning a round, your fans go wild and celebrate with a deafening roar. However, they are not particularly patient and will soon start to shout *Chicken!* if you are seen to be avoiding the action. The referee is a little more subtle – he just goes to sleep.

Above all, the audience likes to see clean fighting. If you or your opponent stoop to ungentlemanly tactics, the crowd socn voices its disapproval by booing the offender.

Like Fist, BFMOF includes options for either one or two-player combat, so you can play either against the micro or another human opponent. The players can be controlled using either the keyboard or joystick, but the latter is very much easier if you have the usual complement of hands.

Although most games now feature joystick control, BFMOF actually allows them to be selected individually, so that one player can use the keyboard and the other a joystick – a rarely-seen feature.

You can switch the sound on or off at will – and if you don't like the crowd turn them off as well. A demo mode gives you a good idea of strategy and gameplay – watch closely.

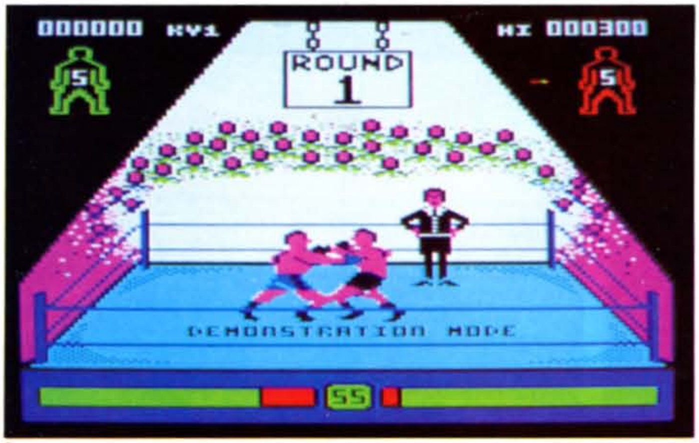
The package includes a specially extended version written to take advantage of the extra memory built into the Master 128 and Master Compact.

The most impressive feature of this is the introductory page that shows head-and-shoulders portraits of the six pugilists – including two giant images of the two about to play. A nice touch is that the boxers actually look like their portraits. Other new features are multi-channel music and a scrolling high-score table.

By Fair Means or Foul is the result of a well-used idea approached from a different direction and, as such, has been implemented well. However, in spite of the extra features provided by the Master version, I still feel that it does not knock Way of the Exploding Fist off the top spot of BBC Micro combat games. I will be interested to see if anything ever does.

Hac-Man

Sound	*6*
Graphics	*7*
Playability	*8*
Value for money	*8*
Overall	*7*



The game in action

Lancelot ... joust a legend

Price: £14.95 (80 track disc).
Requirements: Master or an enhanced BBC Micro
Supplier: Mandarin Software, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP
Tel: 0625 878888

BUY this game, got that? Now we can settle down to secondary matters, such as why. The combination of Level 9 and Mandarin Software made its debut successfully with the Time and Magik trilogy. In Lancelot the quality has taken a giant stride forward – it is, it would appear, possible to improve upon excellence.

If you didn't take my advice to upgrade your BBC Micro when I reviewed Time and Magik, what you should do now is to pawn the wife and children and make the appropriate improvements. If ever a software product determined the hardware configuration, this is it.

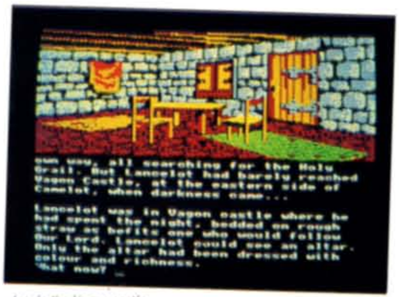
Masters, B+ with sideways ram and BBC B with sideways *and* shadow ram will get pictures – BBC Micros with just shadow or sideways ram will get text only.

I confess that my fingers shook a little as I unwrapped the package, unloaded the booklet and explored the offering. I found very helpful clues in the documentation, an interesting condensation of the Arthurian legend and a booklist that will set people arguing for ages.

The text entranced me: It really is just the sort of thing that makes an adventure first class as against merely good. The quality is consistent throughout:

> *Lancelot was riding east along a forest road. Leafy branches edged the track, which was deep rutted and churned by heavy ox carts and the footsteps of men and horses. This was the road to the great city of Camelot, the heart of the kingdom. An exit led east.*
>
> *Thy command Sire? E*
>
> *Squire Lancelot rode east and was wading through a ford. The river was wide, but ran swiftly here. Exits led east and west. Lancelot could see the Black Knight.*
>
> *The Black Knight sat straight and proud upon his horse and did challenge Lancelot. "Squire, no man can pass this way save with my permission. You must prove your worth before you may cross this ford".*

And so the excellence of the language was established, and continued. I loved *Dusk began to suck the colours from the greying world*. If an adventure can use that elegance of text – and add graphics as well – then I am utterly satisfied. It passed my first test with flying colours – what about the other crucial test?



```
own way, all searching for the Holy
Grail. But Lancelot had barely reached
Vagon Castle, at the eastern side of
Camelot, when darkness came...

Lancelot was in Vagon castle where he
had spent the night, bedded on rough
straw as befits one who would follow
Our Lord. Lancelot could see an altar.
Only the altar had been dressed with
colour and richness.
What now? _
```

Inside the Vagon castle

I am a steady advocate of easy beginnings to adventures: It's the best way to lure a beginner into the plot and then transform him or her into an afficionado, or even an addict.

Lancelot passed faultlessly – even to the extent that if you try to stay up all night you are sent to bed. it's not the ideal bed admittedly, but you do get a night's sleep.

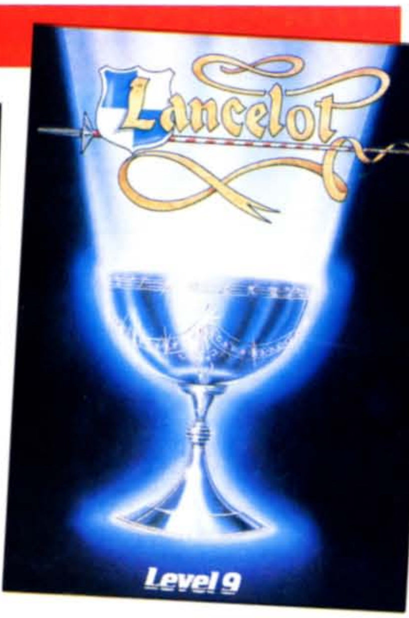
One feature new to me is what are called High Level Commands. Suppose you want to visit a certain location and either can't remember the sequence of moves or can't be bothered to enter them. If you enter GO TO (LOCATION) the computer will work out the route for you – a nice touch.

There are certain principles to be kept in mind when exploring this adventure. You need to display fairly constantly all the virtues of chivalry – courage, courtesy, piety and – especially in the final part – temperance and purity.

The scoring system is based upon the successful completion of tasks. Thus, very early on you have to decide whether or not to offer mercy to the Black Knight. Sparing his life is the key to the rest of the game – and you score 30 points.

It is also possible to have points deducted. If you behave dishonourably, dishonestly or otherwise do something that is immoral, illegal or fattening – particlularly when on the quest for the Grail – you can expect to pay dearly.

Mention of the Holy Grail brings me to my final point.



Associated with the launch of Lancelot is a competition with a beautiful silver goblet as a prize. The clues to its whereabouts are to be found in the adventure and you do not have to be an expert adventurer to have a chance of winning.

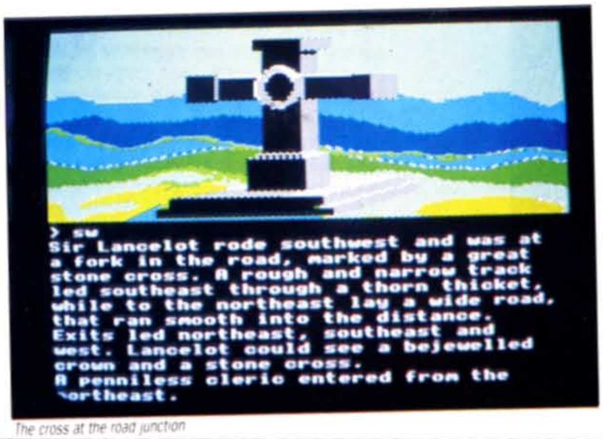
Peter Austin told me himself that you don't have to be capable of solving the whole adventure in order to come across the clues. This is sensible, since it means the competition is open to many more people.

However, be warned. Lancelot is not just available for the enhanced BBC Micro or Master. Owners of other types of micro are going to be hot on the chase, so off you go.

Lancelot has just *got* to be Game of the Year for me.

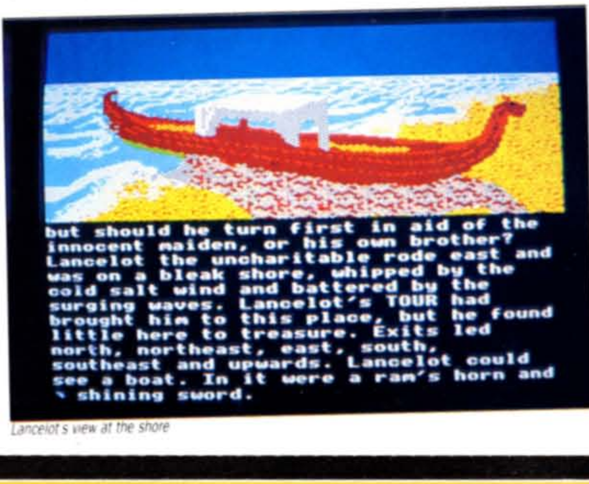
Mad Hatter

Presentation	*10*
Atmosphere	*10*
Graphics	*9*
Value for money	*10*
Overall	*10*



```
> sw
Sir Lancelot rode southwest and was at
a fork in the road, marked by a great
stone cross. A rough and narrow track
led southeast through a thorn thicket,
while to the northeast lay a wide road,
that ran smooth into the distance.
Exits led northeast, southeast and
west. Lancelot could see a bejewelled
crown and a stone cross.
A penniless cleric entered from the
ortheast.
```

The cross at the road junction



```
but should he turn first in aid of the
innocent maiden, or his own brother?
Lancelot the uncharitable rode east and
was on a bleak shore, whipped by the
cold salt wind and battered by the
surging waves. Lancelot's TOUR had
brought him to this place, but he found
little here to treasure. Exits led
north, northeast, east, south,
southeast and upwards. Lancelot could
see a boat. In it were a ram's horn and
 shining sword.
```

Lancelot's view at the shore

Archimedes Games

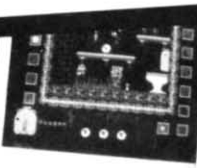
£14.95 each

ORION

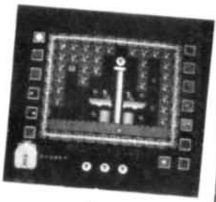
Skillfully manipulate Orion, the latest air to air combat interceptor, to defend your planet against the tide of marauding aliens. Shoot them down before its too late! Score points by saving your men before they are changed into mutants - otherwise they will turn against you. Contains Baiters, Pods which explode into Swarmers and waves of Bombers. Orion is a fast and furious scrolling 'shoot em up' game based on the all time arcade classic.

NEW

HOVERBOD



Hoverbod is a traditional maze adventure in the style of the classic Manic Miner, yet it is of stupendous proportions. Hoverbod, the yellow sperical droid, has been banished from the planet Zingle and goes in search of some stolen treasure. The player must guide him through the perils which befall him and help him puzzle his way through the eight different levels to the final quest level. But beware ... the Ibbles and Squibbles start to materialise !!!!

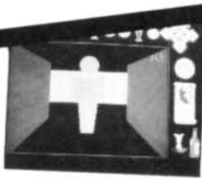


FREDDY'S FOLLY

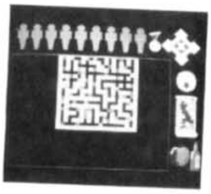
An enchanting game using animated graphics. Just watch the little men load the canon and pull it along. Notice the celebration when they win! Colourful fun for all the family. Sir Freddy is sneaky and envious of your castle so plans to bomb it with a fleet of balloons. You built a battlement to shoot down Sir Freddy in his balloon. Sir Freddy then hired several Gun ships to shoot your canon crew. Defend your castle and shoot down the balloons and the invading ships.

NEW

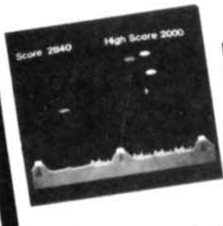
MINOTAUR



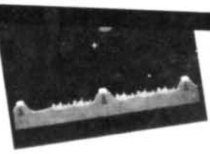
The Minotaur maze game is aimed at a market for children or adults who want a game where quick shoot-out reactions are not necessary. Theseus walks around the Labyrinth, collecting items to assist in the search of the ill fated men which have been provided as food for the Minotaur. The ultimate aim is then to kill the Minotaur and lead the men out of the Labyrinth to safety. The maze size is fully definable by the User. Games may be saved and reloaded for use at a later time.



MISSILE CONTROL



Missile Control is a classic arcade game written for the Archimedes to make full use of the advanced graphics and sound, while remaining faithful to the original concepts of the game. The Player is in control of the missile launches and must do the utmost to protect the cities from the incoming missiles. On each subsequent attack further planes, satellites or 'smart' missiles attack the target cities.



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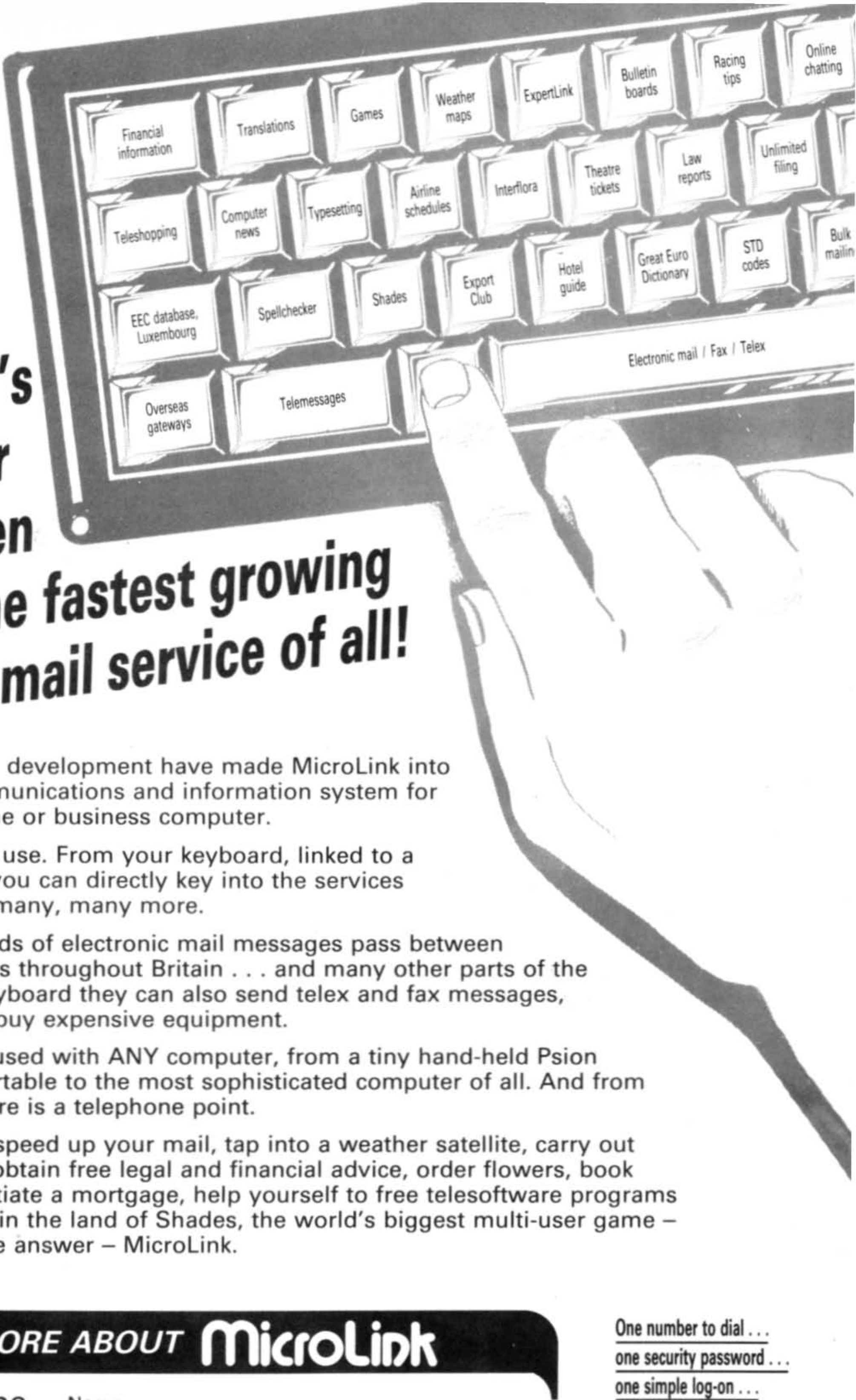
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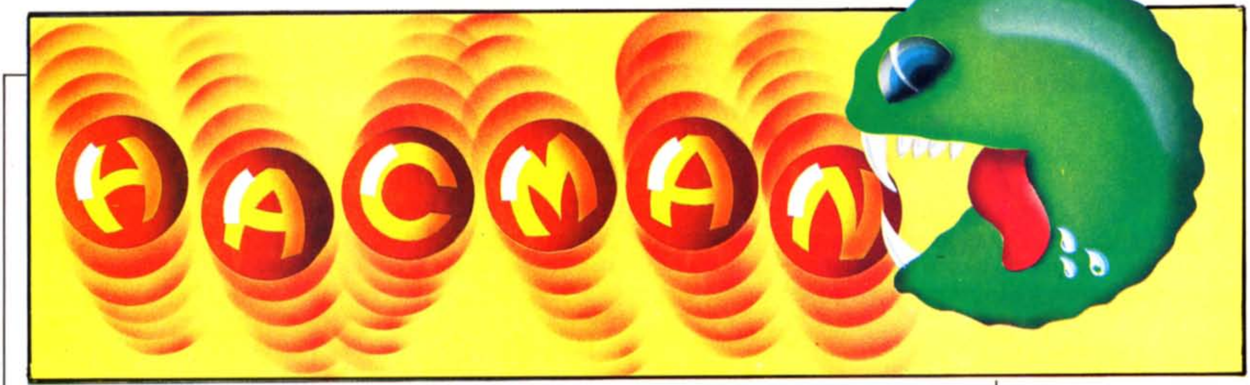

B B+

Teamwork really tells

Hac Man forsees a really great games future for the BBC Micro

GAMES in which you and a friend can play as a team against the micro instead of putting one human player against the micro or another person, are few and far between. Icarus and Skirmish are current examples, and I believe that in such innovation lies the way forward. Three such currently under development are *Bolo*, from Delos D. Harriman – author of Skirmish – and *Maltese Joe's European Pool* and *FireTrack II*, both by Orlando, author of Frak! and the original FireTrack.

Although I first saw Bolo at the end of January 1988 and mentioned it in last July's column, only recently have I received written details about it. As I noted then, Bolo is a real-time tactical wargame that allows up to 16 competitors – each using a different machine – to play simultaneously. The game is set on a large island, the objective simp being to dominate it. Howeve with up to 15 other players tryi to do the same, it is going to be no walkover.

Each player controls a tank which can move around almost any part of the island. The screen, which shows only a small part of the island, scrolls as you explore your surroundings. This technique will be familiar to players of games such as Repton and Ravenskull. The island has everything you would expect to find – swamps, craters, rubble, forests (that actually grow) and lots of water.

The terrain slows your tank down to varying degrees, so you move more slowly through water than through a forest. To allow you to change location speedily you can build bridges and tarmac roads. You can also construct buildings – your home base – and destroy the forests or anything that an opponent may have built.

Stocking up on ammo

You have a limited number of shells and mines, armour plating of only a certain strength. All can be replenished by calling at a refuelling base – but one or more opponents may hamper your access, leaving you at a disadvantage. Conversely, you can try to keep opponents from getting through to refuel and rearm. There are also pillboxes, which at the outset shoot at anything in sight, but they can be disabled and made loyal to one player. Thereafter they attack everyone except that player and his allies.

You can form alliances with others so that two losing players can gang up on a third and form a more effective opposition.

Versions of Bolo are also planned for the Archimedes, Atari ST and Commodore Amiga. Because these machines have RS232 serial interfaces, any combination can play together. Bolo is now nearing the end of its long gestation period. When it arrives it will be a blockbuster.

Over the years a number of pool games have appeared on the BBC Micro, all following the same formula – a plan view of the table. **Maltese Joe's European Pool** brings a refreshing new approach to the traditional game: The display is in 3D perspective with a player's-eye view.

Conventional computer pool and snooker games use the left/right/up/down direction keys to control the angle at which the cue will hit the white ball, and often to control the degree of power or spin with which the shot will be played.

Maltese Joe's Pool uses the left and right keys to rotate the table around the cue ball, as if the player were strolling around the table.

All shots are played directly away from the screen and the up and down keys raise and lower the angle of the table as the player bends over the shot. The angle of elevation alters the spin on the ball, allowing precise control over the way it is struck. Maltese Joe's European Pool should be out early in 1989.

On to Orlando's other offering, Firetrack II. The original was revolutionary enough, featuring smooth vertical scrolling and some amazingly fast shooting action plus a routine to check for the presence of any sideways ram and store 12k of itself there.

Master 128 and Compact owners are used to seeing games that provide extended versions to take advantage of the extra memory of their machines.

But FireTrack was the first – and so far only – arcade game to take advantage of the many near-standard memory expansion boards available for the Model B to produce a much larger game than could be fitted into an unexpanded machine. FireTrack II takes this practice of catering for

Turn to Page 41 ►

Featuring

Maltese Joe's European Pool
Ravenskull
Firetrack II
Bolo

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◄ *From Page 39*

machine expansions to previously unimagined limits. Some games allow only keyboard control; many allow the player to select a joystick option. FireTrack II also features routines to check for a mouse or trackerball and allow the ship to be controlled by either of these input devices.

One feature originally planned for FireTrack II has unfortunately now been shelved, but it is still worth a mention. Like its predecessor and Frak!, FireTrack II features some great music and at one stage of development, Orlando was hoping to include routines to drive a Music 500 or equivalent. Alas, the Music 500 uses so many interrupts – each requiring a certain amount of processor time – that the game would have been far too slow. Another option would have been to omit a number of other planned features but the game itself had to take precedence over the soundtrack.

I think it a great pity that this idea did not come off, because the music produced in this way and transmitted to a full size hi-fi would have been far superior to any music heard on an 8 bit machine. Gary Partis once told me that he designed Syncron as an exercise in pure speed – playability was not supposed to come into it! Perhaps, in the same spirit, someone can produce a simple game as a vehicle for a full soundtrack for the internal speaker – and also for the Music 500, if fitted.

3D terrain

One point that particularly concerns Orlando is that it is very difficult to give computer graphics any convincing impression of depth. I thought the rocky landscapes in the original FireTrack looked very realistic but you were always flying above it. Other games, like WAR and Syncron included tall buildings and structures into which your ship could crash if you did not avoid them – but you could only discover how tall they were by flying into them. FireTrack II will feature three-dimensional hazards designed by revolutionary new graphic techniques so that they stand out from the planet's surface clearly.

Although I first saw FireTrack II in the late summer of 1987, it has been continually put off to make way for Orlando's many other projects. It seemed to be at a fairly advanced stage even then, so I hope to see it soon. The final form in which it will be released is still not clear. It may be disc only, or cassette versions may require the machine's internal memory to be expanded. We'll have to wait and see...

> *Firetrack II takes this practice to previously unimagined limits*

Ravenskull: Storming the castle

A really good game can have an almost unlimited playing life ensnaring the unwary for years. One such product is Superior's **Ravenskull**.

Its main difficulty is that the castle is vast, with many different possible routes, only one of which is correct. One false move and a hidden door will slam behind you, blocking your retreat.

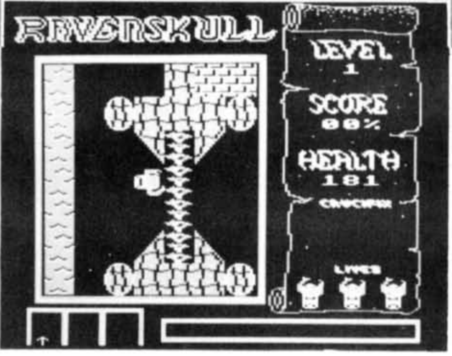
To complete each of the four levels you must collect each piece of treasure and then pick up a quarter of the crucifix. To begin the game you take the green and blue key just to the left of your starting position, and travel anti-clockwise around the outer wall of the castle until you come to the spiked gate on the extreme left-hand side: That is the main entrance. Make sure that you are standing just in front of the gate, and use the key to open the top section. Drop the key and go in.

Go south, down the screen, take the pickaxe and return to the main entrance. Head north and explore the area, making sure that you pick up the scroll and all the treasure. Use the scroll straight away, then abandon it. It opens the back door to the castle – next to where you found the pickaxe – so that you can get back into the castle if you are unfortunate enough to get killed.

Go north at the crossroads until you can see the Ravenbee buzzing backwards and forwards. Wait south of it until it has just passed you, then follow it and duck into the little alcove. Run out as soon as it has passed you again and make your way to the extreme northwest corner of the castle.

Take great care not to fall into the acid pools – one careless step and you will be thrown back outside the castle. Take the green-magenta key in the northwest corner and collect the three pieces of treasure from the far end of that passage, then return to the main entrance.

Go to the east and you'll come to another crossroad with a roundabout in the middle. The other three exits are blocked by spiked gates. Go north and use the green-magenta key to open the gate. Drop this key, because it can be used only once. Move north, not forgetting to collect the lone treasure, until you come to the four gates. Enter the first on the east, pick up the scroll and use it. Do not go north, or the second door on the east will close, blocking off your only means of returning.



When you use the scroll you will be transported to the southeast corner of the castle. Drop it where you reappear, then take the pickaxe that is at the end of the passage to the west. Make your way north, collecting all the treasures, until you eventually come out through the door north of the one through which you found the second scroll.

Do not go straight west, but go south one pace so that you are standing in front of the wall between the two western rooms. Use both pickaxes to dig out this wall so that you can get into either room – and back out again – without going through the doors. Go into the more northern of the two rooms, take the treasure and the magenta-blue key and drop both pickaxes.

● *Continued next month.*

Flesh on the bones

Jim Notman and Ian Whitmore investigate a powerful 3D graphics package

Product: Realtime Solids Modeller
Price: £89.95
Supplier: Silicon Vision Ltd., Signal House, Lyon Road, Harrow, Mddx HA1 2AG
Tel: 01-422 2274

WHEN the BBC Micro was first introduced the quality of the graphics was considered to be amazing. It had, for then, high resolution screen modes and a number of graphics commands built into the operating system which were accessible through Basic. The disadvantage was that these graphics used up a high proportion of the available memory, so that programs requiring high definition graphics had to be small.

The advent of shadow screen ram on the B+ and Master series alleviated much of the limited memory problem. The Master also has extra plotting routines built in with some outlined shapes, colour filled shapes and flood fills. However, all the graphics shapes are drawn in two dimensions, making it difficult to produce the appearance of a 3D object without a considerable amount of time and effort.

This is where the Real Time Solids Modeller fits in, because it is designed to work with three dimensional graphics. The software supplied by Silicon Vision comes in different parts. The most important is the Real Time Graphics 32k palprom which is seen by the operating system as a 16k rom. It is compatible with the B, B+ and Master, as well as 6502 second processors and Quest or AMX mice. PAGE is increased to give workspace for the rom but there is a command – *RGLOFF – which allows the palprom to be switched off so that it does not interfere with anything else.

The further parts of the software are supplied on six 40 track, single sided 5.25in floppy discs formatted for Acorn's DFS. They are unprotected so that the software may be transfered to other formats.

The Real Time Graphics can be used in two ways – as a graphic design system with its own editors and display routines, or as a language, where programs are written in Basic and access the extra graphics features through star commands. *HELP RGL details them, as in Figure I.

Before looking at the language in more detail, let's consider the graphics system. When you boot it the main system menu is displayed – see Figure II – and options are selected with the cursor keys and Return. After selecting the system editor, you are presented with another menu – Figure III. If you now want to enter some graphics data, you'll have to go through yet another menu.

As you may imagine, the data required for drawing a graphic model in three dimensions can be rather complex. Every point is described in the

```
REALTIME GRAPHICS LANGUAGE II
(C) 1987 SILICON VISION
RGL II VERSION 1.00

TURBO3D1
TURBO3D2
RGL3D

ROT3D         <X,Y,Z>
SCALE3D       <X,Y,Z>
TRANS3D       <X,Y,Z>

ORBIT         <X,Y,Z>
PROJECT       <PZ>
PALETTE       <PM,SC,LC,LT>
MATRIX

TURTLE3D      <X,Y,Z,VCT>
PENUP
PENDOWN
FORWARD       <DIST>
BACKWARD      <DIST>
ABSANGLE      <X,Y,Z>
RELANGLE      <X,Y,Z>

SCRN1
SCRN2
TOGSCRN
PAGE1
PAGE2
TOGPAGE
TOGGLEON
TOGGLEOFF

WIRE
CONVEX1
CONVEX2
CONCAVE

VIEW          <FLAG>
CALC          <X,Y,Z>
SCRN          <ADDR>
PAGE          <ADDR>

OBJECT        <NUMBER>
DATABASE      <ADDR>

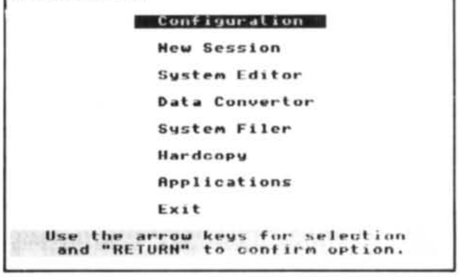
CLS3D

DISPLAY
PLOTTER
VCTLIN        <ADDR>
VCTTRI        <ADDR>

REAL
INTEGER
VARPARMS
NOPARMS
ESCON
ESCOFF
TRACEON
TRACEOFF
MODE          <SCREEN>

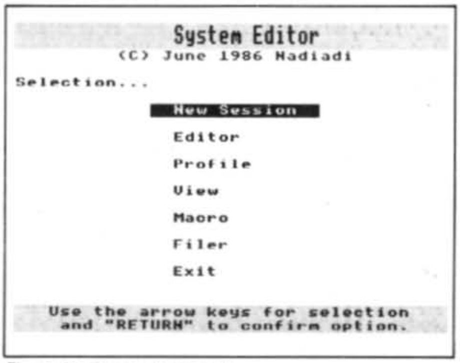
INIT
RGLOFF
RGL
```

*Figure I: RGL star commands displayed with *HELP RGL*



```
Realtime Graphics System
(C) June 1986 Nadiadi
Selection...
Configuration
New Session
System Editor
Data Convertor
System Filer
Hardcopy
Applications
Exit
Use the arrow keys for selection
and "RETURN" to confirm option.
```

Figure II: The main menu



System Editor
(C) June 1986 Nadiadi

Selection...

Use the arrow keys for selection
and "RETURN" to confirm option.

Figure III: The system menu

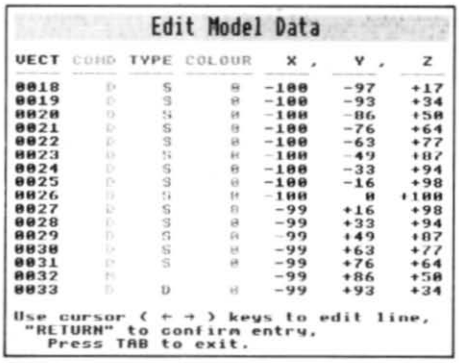
X, Y and Z planes and entered in the editor screen – Figure IV. There are seven columns of information: The first is the instruction number – vector – which is supplied by the editor. The next is the command, with move, draw and facet.

If draw is entered, the type of plotting – solid line or point – is needed, along with its colour. For each solid surface, facet must be used first with its own colour. Finally the X, Y and Z coordinates are entered. Data must be entered in order. If you notice a mistake from a line higher on the screen, you cannot simply cursor up to the position and alter the item. You need to re-enter the editor and indicate where you want to make the changes.

After entering some data you can see it with the View option from the system editor which draws the image in Modes 4 or 5. Modes 0,1 and 2 are also available with 6502 second processor or in Master series machines. The function keys select which type of model is to be drawn – wireframe, convex solid or concave solid.

Figures V and VI show drawings which are supplied with the package. Along the right hand side of the screen are a number of options controlling how the model is to be displayed. The top item – Image – controls whether the model is redrawn every time an option parameter is changed or only if Return is pressed.

The next allows the model to be rotated in any of the three planes. The object may be distorted by changing the scaling factors in any of three axes. Trans will change the origin and move the model around the screen and Persp, short for perspective, represents the viewpoint of the model. At the bottom the increment by which other parameters are changed is set. The numbers are altered by first selecting the editing option with the up and down cursor keys. Then each press of the left and right keys will add or subtract the set increment.

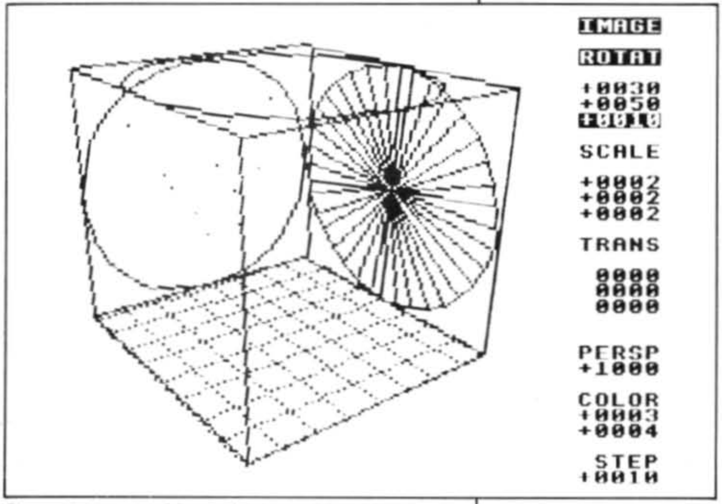


Edit Model Data

VECT	COND	TYPE	COLOUR	X ,	Y ,	Z
0018	D	S	0	-100	-97	+17
0019	D	S	0	-100	-93	+34
0020	D	S	0	-100	-86	+50
0021	D	S	0	-100	-76	+64
0022	D	S	0	-100	-63	+77
0023	D	S	0	-100	-49	+87
0024	D	S	0	-100	-33	+94
0025	D	S	0	-100	-16	+98
0026	D	S	0	-100	0	+100
0027	D	S	0	-99	+16	+98
0028	D	S	0	-99	+33	+94
0029	D	S	0	-99	+49	+87
0030	D	S	0	-99	+63	+77
0031	D	S	0	-99	+76	+64
0032	M			-99	+86	+50
0033	D	D	0	-99	+93	+34

Use cursor (← →) keys to edit line,
"RETURN" to confirm entry.
Press TAB to exit.

Figure IV: Edit screen



```
IMAGE

ROTAT

+0030
+0050
+0010

SCALE

+0002
+0002
+0002

TRANS

 0000
 0000
 0000

PERSP
+1000

COLOR
+0003
+0004

 STEP
+0010
```

Figure V: View graphic wireframe model

Models may be further modified with the Profile option, which allows shapes created by the editor to be rotated about an axis, generating 3D curves and surfaces. It also allows solid facets to be rotated around a point or extruded along an axis.

Once models have been designed, they may be saved or sent to the printer with a graphics dump routine for Epson-compatible printers. The multiplotter disc contains software to send graphics screens to a choice of at least 13 plotters.

When you have developed a feel for the graphics with the design system, you will want to try your hand at using the graphics language. Models which have previously been prepared may be displayed, moved around the screen, rotated

Turn to Page 44 ▶

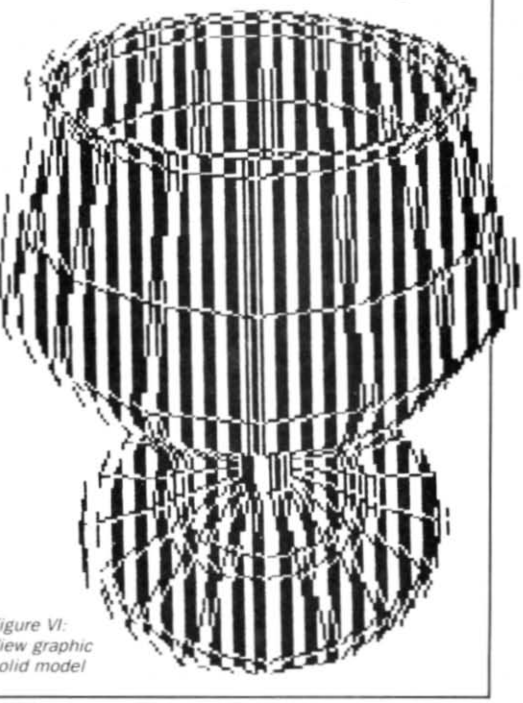


Figure VI: View graphic solid model

◄ From Page 43

and changed in size. The drawing is done amazingly quickly. Silicon Vision quotes a speed of 35,000 pixels per second as compared with the operating system of the BBC Micro's 9,000 pixels per second.

As all the graphics commands are star ones there might have been a problem transferring parameters between Basic and the rom. This has been solved by rigidly defining a list of variables in a set order, with the set variable names at the start of each Basic graphics program, so that the rom can work out where each variable is.

It is just as well that there are demonstration programs to show you what can be done and how to solve some problems such as screen flicker. You might expect there to be some flicker as the graphic object is cleared before being redisplayed.

It is possible with this language to hold two Mode 4 or 5 screens in memory on a B at the same time. This means that one screen can be displayed while the next screen is being drawn and then swapping in the new screen at the appropriate moment, so preventing any flicker. On a B+ or Master shadow screen is used. The graphics language may also be programmed in assembler language. This uses a new osbyte call – 52 – to instruct the rom.

In addition to the commands to control the display of the graphics object and manipulate it in space, there are a set of 3D turtle commands. The turtle graphics most people are familiar with in two dimensions certainly take on a completely different feel in the extra dimension.

The documentation is more than 150 pages long and deals with the graphics system, the graphics language and the solids modeller enhancement separately. The demonstration programs are listed.

Now that the Real Time Graphics Modeller handles hidden line removal and drawing solid objects, missing from the original version 1 system, I found this to be a very interesting package to use. I had two small grouses, first that the numerous menus make moving around the graphics system a little tedious, and secondly the editor could have been easier and more flexible in use.

The obvious market for this package is schools, particularly for maths and science. It is easy to experiment with the wire outline and solids graphics, and the 3D turtle graphics gets high marks for making you think. But it would be a shame if it were only limited to schools. Anyone with an interest in graphics will find it worthwhile.

3D graphics systems are considerably more complex that the usual two dimensional ones. This package certainly helps you get to grips with the third dimension. All you need now is some of the fourth dimension – time – to put it into use.

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More than Basics

John Allen looks at a patch that gives more power to your Z88 programs

IT is the remarkable compatibility between the Acorn machines – the BBC Micro and the Archimedes – and the Z88 which makes the portable so popular with users of these machines. It's especially remarkable because that compatibility is not at the machine code level – since the Z88 uses the Z80 processor – but at the software level.

The two major applications on the Z88 both have their equivalents on the Acorn machines. PipeDream on the Z88 is available on the Archimedes and is file compatible with View Professional on the BBC Micro, and the programming language on all three machines is BBC Basic.

BBC Basic was implemented on the Z88 by Cambridge Computer, basing it on the BBC Micro's Z80 second processor version. On the BBC Micro the two Basics – for the 6502 and Z80 processors – are very nearly identical, but there are some differences on the Z88. This is partly because of the different environment, but none of the graphics commands are included and, most importantly, there's no way of editing lines of a program on the Z88.

This means that the Z88 is not a good machine for developing programs and that those involving

Turn to Page 47 ▶

Richard Russel has supplied us with a new version of his PD software which also dumps the graphics window to an Epson-compatible printer using the command:

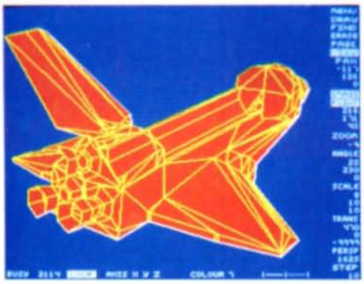
```
CALL 11011
```

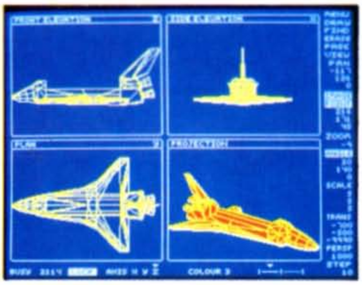
It's on this month's disc and also in the MicroLink telesoftware library.

SILICON VISION

SOFTWARE FOR THE ARCHIMEDES & BBC

SolidCAD





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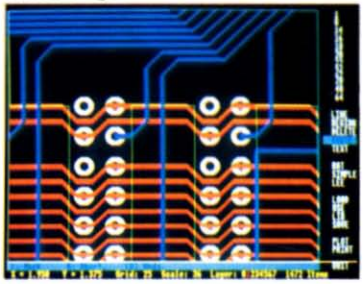

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◀ *From Page 45*

graphics written on the BBC Micro and then transferred, keep failing on the Z88 with *Not implemented* errors.

There's now a partial answer to the problem – a public domain patch to Z88 Basic written by the man who originally wrote the Z80 version of BBC Basic, Richard Russell. It puts back many of the missing graphics commands and contains a line editor. But you do need at least 128k of extra ram to use it.

Being public domain, it is freely available from several sources and can be passed around by Z88 owners. There is also a copy of the patch, instructions in PipeDream format and three demo programs on this month's *The Micro User* disc.

To run the patch on your Z88 you select Basic and type

```
CHAIN"PATCH"
```

It then stays installed until that Basic is KILLed. What does it do? Firstly it contains an editor, so to edit say line 120, you type:

```
*EDIT 120
```

This is much more powerful than the line editor on the BBC Micro and contains many of the PipeDream editing features such as swapping case, working in insert mode, deleting up to next space, delete to end of line and so on – all using the same commands as in PipeDream. It can also be used to join lines together.

Where graphics are concerned the effect is not quite the same as on the BBC Micro. The Z88 is not designed to allow easy mixing of text and graphics, so this patch creates two windows: A text window on the left of 8 rows of 50 characters and a graphics window on the right 64 pixels high by 256 pixels wide. The graphics origin is at the bottom left corner. This way of operating is initiated by entering:

```
MODE 1
```

The normal 94 character wide Z88 Basic window is restored by:

```
MODE 0
```

Once you're in Mode 1 most of the normal graphics commands can be used in the right hand window – these include CLG, DRAW, MOVE, PLOT and POINT. COLOUR and GCOL are not implemented, however, as all graphics are drawn as black on white.

So what are the problems? Although many of the BBC Micro commands are available they don't necessarily have the same effect, so you still can't move programs across without modification. Also text and graphics are not easily mixed, although it is possible to change the test window's size and location.

The patch also interacts strangely with PipeDream, so if you've a suspended activity with mode 1 Basic you may get bits of the Basic graphics in odd places from time to time.

Finally, as the patch is not legal – it calls the operating system directly – there is no guarantee that it will work with future versions of the Z88. Despite this, I have found it to be a welcome extension to the portable's Basic.

CHANGING THE WINDOWS

To get the text and graphics windows to coincide, the former has to be redefined using a VDU1 statement. The graphics window is in a fixed position and text is written to window 1. So if the position of that window is changed the text will be displayed in a different position.

The following simple program illustrates how you can place text in the graphics area, in this case putting a double border round some text:

```
   10 MODE1
   20 VDU1,ASC"7",ASC"#",ASC"1",89,34,64
,36,128
   30 CLS
   40 DRAW 0,63:DRAW 255,63:DRAW 255,0:D
RAW 0,0
   50 MOVE 2,2
   60 DRAW 2,61:DRAW 253,61:DRAW 253,2:D
RAW 2,2
   70 PRINT ".... This is demonstration
text in mode 1 .... "
   80 END
```

Line 20 uses VDU1 to redefine window 1 to start at 57,2 with a width of 32 characters and depth of four lines – these values are set by the 5th, 6th, 7th and 8th parameters respectively with 32 added to each value. The final parameter of the VDU statement gives the window type, in this case one with no border.

If the CLS statement at line 30 is not included the graphics may not stay in the correct position. Lines 40, 50 and 60 draw the border. As the patch will support drawing rectangles this could also have been done by a PLOT command. When you've finished running the program, and want to return the windows to their defaults, enter:

```
MODE 0
```

There's more information on defining and using windows on pages 81 and 82 of the May 1988 issue of *The Micro User*.

Suspense

Ordinarily Z88 Basic programs cannot be suspended when they are running so, for example, pressing Index will have no effect. To make your program suspendable you'll need to include regular commands which temporarily return control to the operating system: INKEY is a good one to use. So periodically put in lines like:

```
DUMMY=INKEY(0)
```

This is particularly useful if you've disabled Escape, as otherwise it may be difficult to leave the program when something goes wrong.

New graphics commands

MODE	Select text only or text and graphics mode.
CLG	Clear the graphics window.
DRAW x,y	Draw a line in black from the current graphics cursor to x,y then move the graphics cursor to x,y.
PLOT n,x,y	Like the BBC Micro PLOT command the action is controlled by n, and the actions are broadly similar, but more comprehensive, than on the standard model B.
POINT(x,y)	This gives the state of the pixel at x,y. It returns 0 for white, 1 for black.

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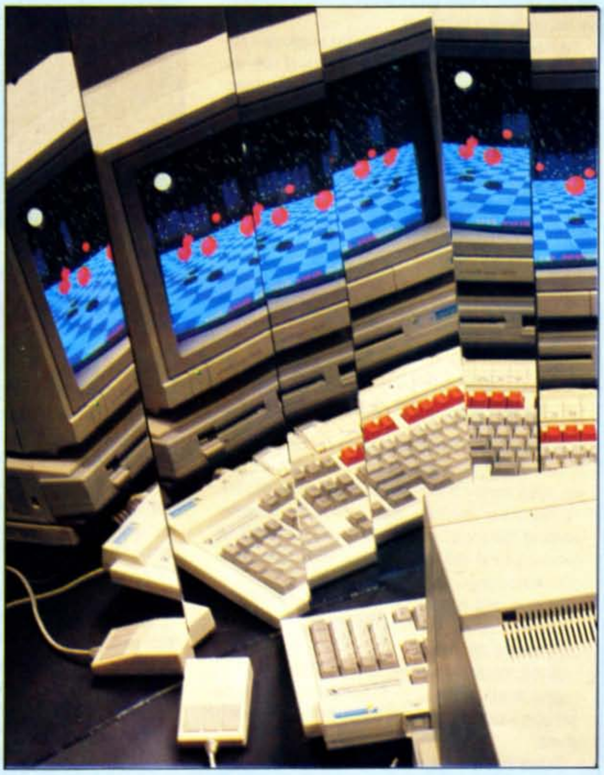
Archimedes action stations!

As software floods in, Acorn's flagship heads for a brilliant future

Special 22 page section starts here

ENTER the Archimedes – the world's fastest micro... That was the headline that screamed out from the leading UK computer magazines – including *The Micro User* – back in 1987.

On the shoulders of the machine, the industry pundits claimed, the future of Acorn would rest. When the covers came off the top secret machine, it certainly boasted some formidable credentials. The entry level model it was revealed was 20 times faster than a BBC Micro.



Benchmark tests showed that the Archimedes possessed the technology to easily outperform the IBM PC AT and Apple Macintosh many times over.

Now – a year on and with all the launch ballyhoo just a distant echo – what is the reality?

Eight months' after its launch, Archimedes, the flagship of the Acorn range, is now getting under full sail towards a bright future.

Having weathered initial storms from lack of sufficient software the super-micro is now backed up by 300 applications designed to make use of its power and speed and this has brought an upward trend in sales.

Acorn communications manager Michael Page says sales are now gathering momentum, particularly in education.

Lack of software is the main stumbling block in the early life of any new micro and the Archimedes was such an innovation that its applications were slow in coming along. But Mr. Page stresses that there are now 300 applications that run under the native operating system.

Compatibility with other machines puts software possibilities into the thousands and more programs are being completed by the week.

"We are pleased that people are beginning to write software that makes use of the Risc technology of our range", he said. "The machines are being used for some quite surprising and imaginative applications which you cannot get any other desktop close to".

Paradoxically, a second stumbling block to early sales was the technological innovation that is the main advantage of the Archimedes.

"We were asking people to make a big leap from the BBC Master series", said Mr. Page. "There is a big gap from Master to Archimedes in terms of technology and some of our major customers needed more time to evaluate this. Now we are seeing education authorities in their dozens making a commitment to the Archimedes in the long term.

"British Telecom is using it for data logging on telephone and telex systems, and several broadcasting companies are beginning to use it for a number of engineering activities behind the scenes".

What does the future hold for the Archimedes?

The keenly awaited 410 that had to take second place to the top of the range 440 earlier in 1988 is now promised for the first half of 1989.

Waiting in the wings is the next new Acorn product – an international Unix based system. But at just under £4,000 that will certainly not be a home based machine.

The top end of the market is currently receiving Acorn attention and as yet there are no plans to take the Archimedes out of its present bracket and produce a cheaper version for the lucrative games market.

Even so a steady flow of games is now becoming available for the machine.

SOFTWARE QUICKIES

Back to the future

Gail Windsor takes a look at heavenly forecasting

"DON'T confuse astrology with the rubbish found in periodicals under the title of Your Stars," says the Astrocalc manual. "True astrology does not claim great accuracy at forecasting ... because it acknowledges the role of free will".

Astrology studies the relationship between the planets and human character and behaviour. Some of its principles can be shown to work and it can be fascinating to cast your own horoscope and that of friends and relatives.

A horoscope or birthchart is a map of the heavens at the exact moment of a person's birth. As you might imagine, the calculations involved are considerable – an ideal task for a micro.

There are three programs and three booklets in the Astrocalc Starter Pack. Astrotutor I teaches you basic information about the planets and star signs and includes a self-test section. A more advanced booklet offers a guide to various astrological techniques.

The main booklet and program are used to calculate and help interpret a birthchart. Apart from the date of birth you also need the time and place down to longitude and latitude.

The time must be input in Greenwich Mean Time and if British Summer Time was in force you must make adjustments. There's a table at the back of the manual to help, although this is the sort of thing the micro should be doing. Finding the longitude and latitude may require a trip to the library, and the micro could have helped here, too. However, once the groundwork has been done the program produces several astrological lists almost instantly.

The manual offers a simple interpretation of the results. It's purely a character analysis, and there is no attempt to predict the future. You could expand on the interpretation with the aid of dedicated astrology books and a book list is included with the pack. The program uses Mode 7 and the displays are purely functional. Two-letter abbreviations are used for the signs, planets and Aspects and on first running – if you're not familiar with the names and terms – it will look like hieroglyphics. A little time with the manual will, however, explain everything and you'll soon be using it easily.

Although Astrocalc could be a little more helpful – it is for beginners, after all – and certainly make some use of the BBC Micro's graphics, it does save hours of calculation time. After a very short familiarisation period you will easily be able to cast anyone's horoscope and interpret the results.

The program under review is a Starter Pack, as its name states, designed to give you a taste of the subject. Astrocalc has more advanced programs – at reduced rates for Starter Pack owners – and these are certainly worth considering if you are at all interested in the subject. They have automatic Summer Time correction and a longitude and latitude finder.

If you're debating whether to dabble or not, the Starter Pack will give you a good introduction. If you are already casting horoscopes it could save hours of work, although you may prefer to plump straight away for one of their more advanced packages.

Product: Astrocalc Starter Pack
Price: £11.50 (5.25in disc)
Supplier: Astrocalc, 67 Peascroft Road, Hemel Hempstead, Herts. HP3 8ER.
Tel: 0442 51809

A bash at making music

Ian Waugh compares his micro to an electronic drum machine

RICE Computer's Rhythm Composer turns your BBC Micro into a drum machine. Many software-based drum units use samples of real drums – or even from dedicated drum machines.

Unlike these, the Rice Drum sounds are computer generated from special formulae. As a result the sounds are remarkably clean and free from noise which makes them ideal for recording.

The drum data is converted into sound by a digital to analogue converter – the black box of the system – which plugs into the user port.

What do they sound like? Well, they are a touch electronic, but they're really not bad at all. To beef them up a bit you can add echo – with long or a short delay – to four selections of drums.

To hear the sounds you must plug the unit into an amplifier – PA or hi-fi. The standard drum unit has one jack socket. The drum and bass sequencer contains additional hardware for the bass sound along with a second output socket. This means you can run the sounds separately through a mixer or FX processor although if your hi-fi only has one input you'll have to make or buy some junction leads.

There are seven drums to choose from – bass, snare, two toms, metronome, cowbell and open and closed hi-hats. You can load different sounds into each drum position – one of the advantages of a software-based unit – and 12 additional sounds are included.

A drum track is constructed in traditional drum machine fashion. Up to 32 patterns can be created on a Mode 7 display and then chained together to form a complete song or drum track although once created a track cannot be edited later. Each pattern can contain up to 32 steps, and up to 12 songs can be stored in memory at once and saved to disc.

Patterns are very easy to program. The function keys are used to enter hits on a grid and you can program in real-time or step-time. There are several programming aids such as an auto hi hat fill, the auto clearing of a complete drum line and pattern copying.

The bass sequencer program has an additional line at the bottom of the screen for the bass sequence. There are four bass sounds which alter the harmonic content (brightness) of the sound – you don't get a choice of slap, double or bass guitar – and four volume levels.

Notes are entered with the qwerty keys – asdfghj produces the notes C to B and wetyui produces the sharps. Return is used to raise a note an octave.

I can't help thinking it would be easier to enter notes by name so that, for example, pressing *A* would produce an A note and *a* would give you A#. Programming a bass line with the qwerty keys is not very practical, especially in real-time.

In spite of a couple of quibbles, the system as a whole works very well and is remarkably effective. As it's software-based, updates are easily and cheaply implemented.

As an alternative to a cheap dedicated drum machine these packages must be a tempting proposition especially if you want to record them and are on a tight budget.

Product: Rhythm Composer and Bass Sequencer
Price: Drum Unit £47.50, Plus Bass Synthesiser £85.00 (5.25 in) disc
Supplier: Rice Computer Electronics, P.O. Box 2, Morecambe, Lancs, LA4 4PP.

SOFTWARE QUICKIES

Making sense in Babel

Peter Irons gives his discs more meaningful filenames

CASSETTES have one advantage over discs – you can squeeze another three letters worth of meaning into the filenames. Let's face it, with seven letters, or even 10, you are forced to resort to abbreviations which quickly become meaningless. Have you ever wished for a longer filename? Well, The List gives you that – up to 39 characters.

The List is a *RUN !Boot file which can be freely copied to all of your discs. When booted it presents a smart Mode 7 screen with a catalogue of the filenames down the left hand side. These swirl on to the screen – very arcady – and if you have a Master the time and date are displayed, too.

The cursor keys are used to highlight and scroll through the filenames and you can enter up to a 39-character description of each one in turn. This information is held in a separate file on the disc.

Initially The List only reads a single side of the disc but it can be configured easily to read two sides. It is DFS and ADFS compatible and when running under the latter you can step through the directories one at a time or use a Zap feature which lets you go directly to any sub-directory.

I've sometimes thought it would be nice if you could CHAIN or *RUN a program from The List, but to be fair that's not its purpose.

Once you've entered and saved the descriptions you can obtain a printout of the information. There are no print options though, or a facility to change the printer ignore character. The routine prints one DFS drive or one ADFS directory per sheet. You can hide filenames from the printout – if you only wanted a record of the first file of a multi-loader game, for example.

Each copy of The List is individually stamped with your name which appears on the screen – a neat personal touch.

Although you could use The List on all your discs, it will be of most benefit on ones containing an assortment of material or those whose contents don't easily fall into one category. The major drawback under DFS use is its consumption of two filenames, but I feel the benefits far outweigh the disadvantages.

I suppose if you were totally organised you wouldn't need The List at all, but I don't know anyone who's as well-organised as that. It may appear expensive, but if you have cryptic filenames scattered throughout your discs it could save you an awful lot of time and effort. I'm glad I got this to review.

Product: The List
Price: £15.75 (5.25in disc)
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Taking Riscs with disassembly

Ian Kirk builds a program to take apart your memory

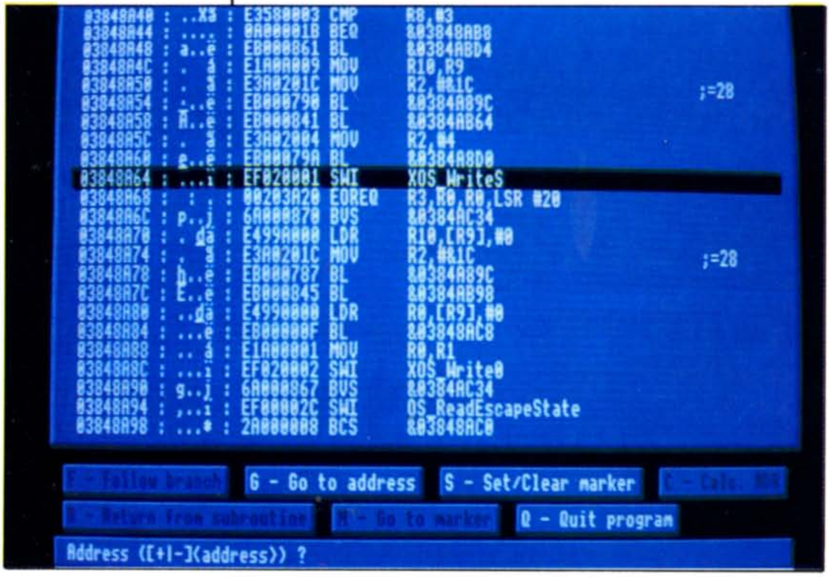
IN common with all Acorn micros all the way back to the Atom, the Archimedes has a built-in assembler and, unlike the others, it also has a limited disassembler – the debugger module's inefficient MEMORYI and MEMORYA commands. But here's a solution to the problem – a full feature disassembler with which you can jump around memory to your heart's content.

So type in the listing, save it and check it with the new Archimedes Get it Right! program on Page 63. When you've corrected any typing errors RUN it and the screen will divide into a large window at the top containing 23 disassembled instructions and a series of small option plaques below.

The black cursor bar in the centre of the window can be moved up and down by a single line with the up/down arrow keys, or by a full screen with Shift+up/down or the Page up/down keys. The cursor is initially positioned at the start of the code assembled by PROCassem, though this can be changed by altering the value assigned to *mem%* in line 210. As the cursor is moved down you'll see various plaques light up and when this happens it means the options are available.

With this utility you can decode programs of all kinds – find out for yourself how Arthur executes all those nice commands, or if you're up to a real challenge see how they managed to make Arc-Writer so slow.

A note of caution though – Basic sometimes behaves strangely when trying to access rom with the *!* indirection operator giving unpredictable *Addressing Exception* errors for addresses that are definitely mapped. This only seems to happen when trying either Go to's or branch tracing with



```
03848A40 : ..X3 : E3580003 CMP   R8,#3
03848A44 : .... : 0A00001B BEQ   &03848AB8
03848A48 : a..ë : EB000861 BL    &0384ABD4
03848A4C : .  á : E1A0A009 MOV   R10,R9
03848A50 : .  ã : E3A0201C MOV   R2,#&1C                  ;=28
03848A54 : ...ë : EB000790 BL    &0384A89C
03848A58 : A..ë : EB000841 BL    &0384AB64
03848A5C : .  ã : E3A02004 MOV   R2,#4
03848A60 : e..ë : EB00079A BL    &0384A8D0
03848A64 : ...ï : EF020001 SWI   XOS_WriteS
03848A68 : :  . : 00203A20 EOREQ R3,R0,R0,LSR #20
03848A6C : p..j : 6A000870 BVS   &0384AC34
03848A70 : . dä : E499A000 LDR   R10,[R9],#0
03848A74 : .  ã : E3A0201C MOV   R2,#&1C                  ;=28
03848A78 : b..ë : EB000787 BL    &0384A89C
03848A7C : E..ë : EB000845 BL    &0384AB98
03848A80 : ..dä : E4990000 LDR   R0,[R9],#0
03848A84 : ...ë : EB00000F BL    &03848AC8
03848A88 : .. á : E1A00001 MOV   R0,R1
03848A8C : ...ï : EF020002 SWI   XOS_Write0
03848A90 : g..j : 6A000867 BVS   &0384AC34
03848A94 : ,..ï : EF00002C SWI   OS_ReadEscapeState
03848A98 : ...* : 2A000008 BCS   &03848AC0
```

```
Address ([+|-](address)) ?
```

AVAILABLE OPTIONS

F	Follows a branch, stacking return address for BLs – branch and link.	**S**	Set a marker up to a maximum of 10 at current line, or if one already exists there, clear it.
C	Calculate address referenced by an ADR type instruction – ADD/SUB reg,pc,#imm.	**R**	Return from a subroutine previously followed with F.
G	Go to an address – either an absolute address, plus/minus a displacement or to an address referenced by an ADR type instruction.	**M**	Go to marker – you only need to actually specify which marker if more than one is set.
		Q	Quit program.

```
10 REM > Disassem
20 REM by Ian Kirk
30 REM (c) The Micro User
40 ON ERROR PROCerror:END
50 PROCinit:PROCedit
60 PROCquit:END
70 DEF PROCerror
80 ON ERROR OFF:PROCquit
90 REPORT:PRINT" at ln ";ERL
100 ENDPROC
110 DEF PROCquit:*FX4
120 MODE oldmode%:ENDPROC
130 DEF PROCinit:oldmode%=MODE:*FX4,2
140 MODE 12:WIDTH 0:OFF:*FX225,128
150 DIM code 300,stk%(50),lstsbr%(50)
160 OS_WriteI=&100:up=&8F:down=&8E
170 PROCassem:mem%=lnstart
180 sptr%=-1:nummrks%=0
190 mrkstore$=STRING$(80,"X")
200 VDU 23,16,&01,&FE|
210 COLOUR 1,128,128,240
220 COLOUR 2,80,80,208
230 COLOUR 3,32,32,160
240 COLOUR 4,240,128,128
250 COLOUR 12,240,128,128
260 COLOUR 13,240,240,240
270 COLOUR 14,240,128,128
280 COLOUR 15,240,240,240
290 black=0:lightblue=1:midblue=2
300 darkblue=3:palered=14:white=15
310 adrcol=4:brcol=8:sbrcol=9
320 sbrmess=10:edmrcol=11
330 GCOL lightblue:MOVE 0,1024
340 MOVE 1280,1024:PLOT 85,0,236
350 GCOL darkblue:MOVE 1280,1020
360 PLOT 85,1280,236:GCOL midblue
370 RECTANGLE FILL 8,244,1262,768
380 PROCplaqueupdate
390 COLOUR 128+midblue
400 PROCplaque("F - Follow branch",2,2
```

targets around &3800000, though the addresses giving the error can be safely reached with Page up/down. However some of these errors are real, as you can't check rom mapping in advance or trap the errors caused by trying to read unmapped rom in Basic when they do occur, so you just have to live with it.

For those of you interested in the program's operation, several of the new features introduced in Basic V and the Arthur have been used. The most fundamental is the Debugger_Disassemble SWI via the new SYS command which removes the need to write code to explicitly disassemble a word – even with a reduced instruction set it would mean a long program. However it is necessary to add a fix because the debugger call doesn't calculate the destination of branches correctly.

The facility to trap and return from errors within procedures is also handy and comes into play in FNsafeeval which uses it to prevent a *No such variable* crash if a duff address is entered at the Go to stage. As well as simplifying the writing of the code, such changes also make things far more readable. For example, the CASE structure greatly aids the tieing of sections of code to key presses, and the palette switching to flash the plaque messages is that bit easier to follow when the expanded form of the COLOUR command is used.

And there it is: A complete Archimedes ARM code disassembler in a very short space.

MAJOR VARIABLES

mem%	Current cursor address within memory.
inst$	Disassembled instruction at cursor.
nummrks%	Number of marks currently set.
mrkstore$	Stores addresses of markers.
actln%	Line cursor is on – 0 to 22.
stk%()	Return addresses from subroutines.
lstsbr%()	Start addresses of subroutines.
sptr%	Stack pointer for subroutines.

MAJOR ROUTINES

init	Sets up colours, variables and display.
assem	Assembles ARM code.
wordprint	Prints disassembly of single instruction.
validate	Disassembles word and sets flags.
newscreen	Prints disassembly of 23 instructions – one screen's worth.
edit	Recognises key pressed and acts on it.
highlightline	EORs cursor on to and off of screen
plaque	Draws plaque on screen.
plaqueupdate	Sets palette to illuminate plaque messages.
message	Prints message in message plaque.
messclear	Removes message from message plaque.
goto	Sends cursor to given address.
onscreen	TRUE if given address appears on screen.
FNeval	Error proof version of Basic EVAL.

```
7,brcol)
  410 PROCplaque("G - Go to address",22,
27,white)
  420 PROCplaque("S - Set/Clear marker",
42,27,white)
  430 PROCplaque("C - Calc. ADR",65,27,a
drcol)
  440 PROCplaque("R - Return from subrou
tine",2,29,sbrcol)
  450 PROCplaque("M - Go to marker",31,2
9,edmrcol)
  460 PROCplaque("Q - Quit program",50,2
9,white)
  470 PROCplaque(STRING$(78," "),1,31,wh
ite)
  480 actln%=11:PROCnewscreen(mem%-48)
  490 ENDPROC
  500 DEF PROCwordprint(addr%,RETURN ins
t$)
  510 PROCvalidate(addr%)
  520 IF goodmem% THEN
  530 A%=addr%:F%=!addr%:CALL lnstart
  540 IF INSTR(inst$,"PC")>0 COLOUR pale
red
  550 PRINT" "inst$;:COLOUR white
  560 ELSE
  570 IF addr%<0 A%=-1 ELSE A%=addr%
  580 PRINT"   ";FNlzh(A%);" : n/a  : XX
XXXXXX Address not mapped to physical RA
M";
  590 ENDIF
  600 tmp%=INSTR(mrkstore$,FNlzh(addr%))
  610 IF tmp%>0 COLOUR 128+black:COLOUR
white:PRINTTAB(0,VPOS);(tmp%-1)/8;:COLOU
R 128+midblue
  620 ENDPROC
  630 DEF FNlzh(word%):a$=STR$~word%:=ST
RING$(8-LENa$,"0")+a$
  640 DEF PROCvalidate(mem%)
  650 SYS "OS_ValidateAddress",mem%,mem%
 TO ;flag%
  660 goodmem%=(((flag% AND 2)=0) OR mem
%>&2000000)
  670 IF goodmem% THEN
  680 val%=!mem%
  690 SYS "Debugger_Disassemble",!mem% T
O ,buff%,len%
  700 buff%?len%=13:inst$=$buff%
  710 branch%=((val%AND&0E000000)=&0A000
000)
  720 IF branch% THEN
  730 disp%=(val%AND&00FFFFFF)<<2
  740 IF (disp%AND&00800000)<>0 disp%=di
sp% OR &FF000000
  750 disp%=(mem%+disp%+8) AND &3FFFFFF
  760 MID$(inst$,10,12)=FNlzh(disp%)
  770 ENDIF
  780 tmp%=(val%AND&03EF0000)
  790 adrtype%=(tmp%=&028F0000 OR tmp%=&
024F0000)
  800 ELSE
  810 branch%=FALSE:adrtype%=FALSE
  820 ENDIF
  830 ENDPROC
  840 DEF PROCnewscreen(start%)
  850 LOCAL a%,loc%:COLOUR 128+midblue
  860 GCOL 3,2:PROChighlightln
  870 VDU 28,1,23,78,1,12
  880 FOR a%=1 TO 23:loc%=start%+4*a%
  890 PROCwordprint(loc%,inst$)
  900 IF a%<23 PRINT
  910 NEXT
  920 PROChighlightln
  930 PROCplaqueupdate:ENDPROC
  940 DEF PROCedit:fin=FALSE
  950 COLOUR 128+midblue:GCOL 3,2
  960 REPEAT:CASE GET$ OF
  970 WHEN CHR$(up):
  980 IF INKEY(-1) OR INKEY(-64) THEN
  990 mem%-=88:PROCnewscreen(mem%-4*actl
n%-4)
 1000 ELSE
 1010 WAIT:PROChighlightln
 1020 actln%-=1:mem%-=4
 1030 IF actln%<0 VDU 23,7,0,2:30:actln%
=0:PROCwordprint(mem%,inst$)
 1040 PROChighlightln
 1050 ENDIF
 1060 WHEN CHR$(down):
 1070 IF INKEY(-1) OR INKEY(-79) THEN
 1080 mem%+=88:PROCnewscreen(mem%-4*actl
n%-4)
 1090 ELSE
 1100 WAIT:PROChighlightln
 1110 actln%+=1:mem%+=4
 1120 IF actln%>22 VDU 23,7,0,3::actln%=
22:PRINTTAB(0,22);:PROCwordprint(mem%,in
st$)
 1130 PROChighlightln
 1140 ENDIF
 1150 WHEN "S","s":
 1160 IF INSTR(mrkstore$,FNlzh(mem%))=0
THEN
 1170 IF nummrks%<10 THEN
 1180 tmp%=INSTR(mrkstore$,"X")
 1190 COLOUR 128+black:COLOUR white
 1200 PRINTTAB(0,actln%);(tmp%-1)/8;
 1210 COLOUR 128+midblue
 1220 MID$(mrkstore$,tmp%,8)=FNlzh(mem%)
 1230 nummrks%+=1
 1240 ENDIF
 1250 ELSE
 1260 IF nummrks%>0 THEN
 1270 tmp%=0:REPEAT tmp%=INSTR(mrkstore$
,FNlzh(mem%),tmp%+1)
 1280 UNTIL ((tmp%-1) MOD 8)=0
 1290 COLOUR 128+midblue
```

Turn to Page 54 ►

◀ From Page 53

```
 1300 PRINTTAB(0,actln%)SPC1;
 1310 MID$(mrkstore$,tmp%,8)=STRING$(8,"
X")
 1320 nummrks%-=1
 1330 ENDIF
 1340 ENDIF
 1350 WHEN "M","m":
 1360 IF nummrks%>0 THEN
 1370 IF nummrks%>1 THEN
 1380 pos$="":lstpos%=-2:fstseq%=-2
 1390 FOR A%=0 TO 9
 1400 IF MID$(mrkstore$,8*A%+1,1)="X" TH
EN
 1410 IF lstpos%=A%-1 IF fstseq%<>lstpos
% pos$=pos$+"-"+STR$(lstpos%)
 1420 ELSE
 1430 IF lstpos%=A%-1 lstpos%=A% ELSE po
s$=pos$+","+STR$(A%):fstseq%=A%:lstpos%=
A%
 1440 ENDIF
 1450 NEXT
 1460 IF lstpos%=9 IF fstseq%<>9 pos$=po
s$+"-9"
 1470 pos$=MID$(pos$,2):PROCmsg("Which m
arker ("+pos$+") ?")
 1480 A$=GET$
 1490 IF A$>="0" IF A$<="9" IF MID$(mrks
tore$,8*VAL(A$)+1,1)<>"X" tgt%=VAL(A$) E
LSE tgt%=-1:SYS "OS_Byte",138,0,ASC(A$)
 1500 ELSE
 1510 tgt%=0:WHILE MID$(mrkstore$,8*tgt%
+1,1)="X":tgt%+=1:ENDWHILE
 1520 ENDIF
 1530 PROCmessclear
 1540 IF tgt%>=0 taddr%=EVAL("&"+MID$(mr
kstore$,8*tgt%+1,8)):PROCgoto(taddr%)
 1550 ENDIF
 1560 WHEN "G","g":
 1570 IF adrtype% adp$="|ADR" ELSE adp$=
""
 1580 gm$="Address ([+|-]<address>"+adp$
+") ? ":PROCmsg(gm$)
 1590 VDU 26:ON:adr$=FNsafeinput:OFF
 1600 PROCmessclear
 1610 FOR A%=1 TO LEN(adr$)
 1620 tmp$=MID$(adr$,A%,1):IF tmp$>="a"
IF tmp$<="z" THEN MID$(adr$,A%,1)=CHR$(A
SC(tmp$)-32)
 1630 NEXT
 1640 IF LEFT$(adr$,3)="ADR" IF adrtype%
 adr%=FNADRcalc ELSE adr%=FNsafeeval(adr
$)
 1650 IF adr%>=0 OR (adr%<0 AND LEFT$(ad
r$,1)="-") THEN
 1660 adr%=adr%AND&FFFFFFFC
 1670 IF LEFT$(adr$,1)="-" OR LEFT$(adr$
,1)="+" tgt%=mem%+adr% ELSE tgt%=adr%
 1680 PROCgoto(tgt%)
 1690 ENDIF
 1700 WHEN "F","f":
 1710 IF branch% THEN
 1720 IF (!mem% AND 1<<24)>0 sptr%+=1:st
k%(sptr%)=mem%+4:lstsbr%(sptr%)=EVALMID$
(inst$,9,9)
 1730 PROCgoto(EVALMID$(inst$,9,9))
 1740 PROCmessclear
 1750 ENDIF  -
 1760 WHEN "R","r":IF sptr%>-1 PROCgoto(
stk%(sptr%)):sptr%-=1
 1770 WHEN "C","c":
 1780 IF adrtype% THEN
 1790 PROCmsg("Referenced address is &"+
FNlzh(FNADRcalc))
 1800 C%=GET:SYS "OS_Byte",138,0,C%
 1810 PROCmessclear
 1820 ENDIF
 1830 WHEN "Q","q":fin=TRUE
 1840 ENDCASE
 1850 PROCplaqueupdate
 1860 UNTIL fin:ENDPROC
 1870 DEF PROChighlightln
 1880 RECTANGLE FILL 32,1024-32*(actln%+
2),1216,32
 1890 ENDPROC
 1900 DEF PROCassem
 1910 stack=13:link=14
 1920 FOR pass%=0 TO 2 STEP 2
 1930 P%=code:[OPT pass%
 1940 .lnstart
 1950 ; r0 (A%) = address on entry
 1960 ; r5 (F%) = word on entry
 1970 STMFD (stack)!,{link}
 1980 ADR r10,buffer:MOV r1,r10
 1990 SWI OS_WriteI+ASC(" ")
 2000 SWI OS_WriteI+ASC(" ")
 2010 MOV r2,#20:SWI "OS_ConvertHex8"
 2020 MOV r0,r10:SWI "OS_Write0"
 2030 SWI OS_WriteI+ASC(" ")
 2040 SWI OS_WriteI+ASC(":")
```

Turn to Page 58 ▶

This is one of hundreds of programs available FREE for downloading on

MicroLink

In addition to these many BBC Micro programs in the MicroLink library will also run on the Electron.

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 917E E
  50 = 1910 B
  60 = C88B 2
  70 = 72B4 2
  80 = 561A 9
  90 = AC90 A
 100 = ED0F 2
 110 = 3235 4
 120 = A36B 4
 130 = E515 4
 140 = 287E C
 150 = A876 0
 160 = 752C B
 170 = A327 2
 180 = 16F0 B
 190 = D78F 7
 200 = 55BF B
 210 = 762C F
 220 = 179F 7
 230 = B114 A
 240 = 66A6 5
 250 = B825 5
 260 = D8F6 C
 270 = 374E 4
 280 = 579D 6
 290 = A2F8 2
 300 = 7C77 A
 310 = ECC8 B
 320 = 6A48 3
 330 = 6EB5 F
 340 = BB1E 6
 350 = 9BFF 6
 360 = E979 2
 370 = 74C3 1
 380 = 4DE4 E
 390 = 15F9 1
 400 = 7B04 3
 410 = A81A 8
 420 = 39D7 E
 430 = 3CB5 4
 440 = 70C1 7
 450 = 4D3E 5
 460 = 3D2F E
 470 = CAB6 9
 480 = 1F68 9
 490 = ED0F C
 500 = EDFB 1
 510 = E613 6
 520 = DA1A F
 530 = D817 4
 540 = 81A5 3
 550 = 673E D
 560 = 18C0 1
 570 = 1BDF 7
 580 = 8DF0 C
 590 =  8E1 F
 600 = 6C22 D
 610 = 4BC6 F
 620 = ED0F A
 630 = 1B88 5
 640 = 6C11 2
 650 = D6C4 6
 660 = A793 9
 670 = DA1A 2
 680 = EE32 A
 690 = F5A2 1
 700 = 2C0C 4
 710 = 9ADD 1
 720 = B256 E
 730 = DF5D B
 740 = 667F A
 750 = 5628 F
 760 = 52F7 8
 770 =  8E1 4
 780 = 5B52 5
 790 = 8E4A 0
 800 = 18C0 8
 810 = D308 8
 820 =  8E1 1
 830 = ED0F A
 840 = 2751 E
 850 = A32F 6
 860 = 2DE9 3
 870 = A146 A
 880 = 6387 E
 890 = 5C51 C
 900 = D34F 0
 910 = 2C83 F
 920 = 435A 1
 930 = C16B 2
 940 = 9398 9
 950 = 6F89 0
 960 = 5DAA 5
 970 = 8E87 A
 980 = 44D6 C
 990 = 10DF D
1000 = 18C0 8
1010 = 3AAA 9
1020 = 7C70 8
1030 = FAC1 D
1040 = 435A 5
1050 =  8E1 4
1060 = 9977 A
1070 = D701 0
1080 = D76A 3
1090 = 18C0 D
1100 = 3AAA D
1110 = 3F24 E
1120 = 127E F
1130 = 435A E
1140 =  8E1 8
1150 = 4333 9
1160 = 843E 9
1170 = 2B52 C
1180 = FE47 D
1190 = B98B 5
1200 = EF67 1
1210 = 15F9 5
1220 = 741F E
1230 = FE05 0
1240 =  8E1 7
1250 = 18C0 4
1260 = 3244 3
1270 = 7917 7
1280 = 2942 E
1290 = 15F9 4
1300 = E3F2 5
1310 = 87BA 0
1320 = 4CA5 3
1330 =  8E1 7
1340 =  8E1 0
1350 = 1EA2 E
1360 = 3244 F
1370 =  574 3
1380 = 171B 6
1390 = B3EF 6
1400 = FBC0 F
1410 = B51D 1
1420 = 18C0 1
1430 = CBEF 2
1440 =  8E1 A
1450 = 2C83 B
1460 =  FAC 0
1470 =  399 F
1480 = 77F2 A
1490 = C34D 2
1500 = 18C0 9
1510 = DCF0 7
1520 =  8E1 E
1530 = A60B E
1540 = 1DA2 1
1550 =  8E1 3
1560 = 2A2D A
1570 = 8D1F F
1580 = BC89 A
1590 = DF89 0
1600 = A60B 2
1610 = FE97 1
1620 = 3926 3
1630 = 2C83 6
1640 = 1A7C D
1650 = 81E6 C
1660 = 5AE3 E
1670 = AA7F C
1680 = CF20 F
1690 =  8E1 F
1700 = A57C 4
1710 = B256 F
1720 = 8A78 2
1730 = 3BFA 0
1740 = A60B 2
1750 =  8E1 2
1760 = 3E87 8
1770 = 372B 7
1780 = 4F5E 6
1790 = 48EF 0
1800 = 1A0B 6
1810 = A60B B
1820 =  8E1 5
1830 = 7A6E D
1840 = 6827 E
1850 = 4DE4 4
1860 =  95D 7
1870 = B9AB 3
1880 = E49C F
1890 = ED0F D
1900 = B623 F
1910 =  3CF 1
1920 = F87C 2
1930 = E4A3 8
1940 = 5C10 0
1950 = D8E4 4
1960 = DB83 0
1970 = 2CB6 F
1980 = 37EB 2
1990 = E3FF 7
2000 = E3FF 2
2010 = D75A A
2020 = 998F 5
2030 = E3FF 9
2040 = 675D 1
2050 = E3FF 7
2060 = 2310 8
2070 = 10D7 D
2080 = 9873 A
2090 = EFDB 6
2100 = E3FF 4
2110 = 675D 0
2120 = E3FF F
2130 = FF70 4
2140 = 4848 D
2150 = 998F 2
2160 = FA34 C
2170 = D7C8 2
2180 = C24A D
2190 = 7994 D
2200 = CC09 D
2210 = A232 1
2220 = 953B 3
2230 = B7ED 0
2240 = C4E0 C
2250 =  607 C
2260 = 6C05 D
2270 = 6E53 5
2280 = AEA0 8
2290 = 582E 6
2300 = EECD 0
2310 = E0F0 C
2320 = 97D5 6
2330 = EA2B 9
2340 = F2B1 3
2350 = 6872 A
2360 = DA1A E
2370 = CB7F F
2380 = A2DA E
2390 = 18C0 E
2400 = 7126 4
2410 =  8E1 9
2420 = D424 2
2430 = E371 3
2440 = D9F7 A
2450 = 18C0 E
2460 = 9F00 0
2470 = 8325 8
2480 =  8E1 9
2490 = B0FC E
2500 = ED0F 2
2510 = 37ED D
2520 =  A98 7
2530 = 4E27 B
2540 = DE79 B
2550 = 547D 0
2560 = B436 4
2570 = 5F08 B
2580 = 788D D
2590 = ED0F 1
2600 = 1887 1
2610 = 13D0 F
2620 = C2D5 D
2630 = 435A 1
2640 = 448E 1
2650 = 435A 9
2660 = 18C0 4
2670 = 435A 0
2680 = 505F 1
2690 =  8E1 9
2700 = ED0F C
2710 = ADCC 8
2720 = 27D4 D
2730 = F2E8 1
2740 = 80A1 F
2750 = EC09 6
2760 = D767 4
2770 = ED0F A
2780 = 9683 B
2790 = 15B8 2
2800 = FF8C 9
2810 = 4F84 1
```

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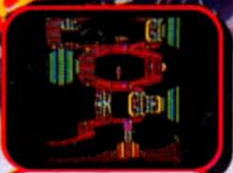
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- A Novella, which sets the scene for the Exile game.
- An Instruction Manual.

The game was designed and written by Peter Irvin and Jeremy Smith.

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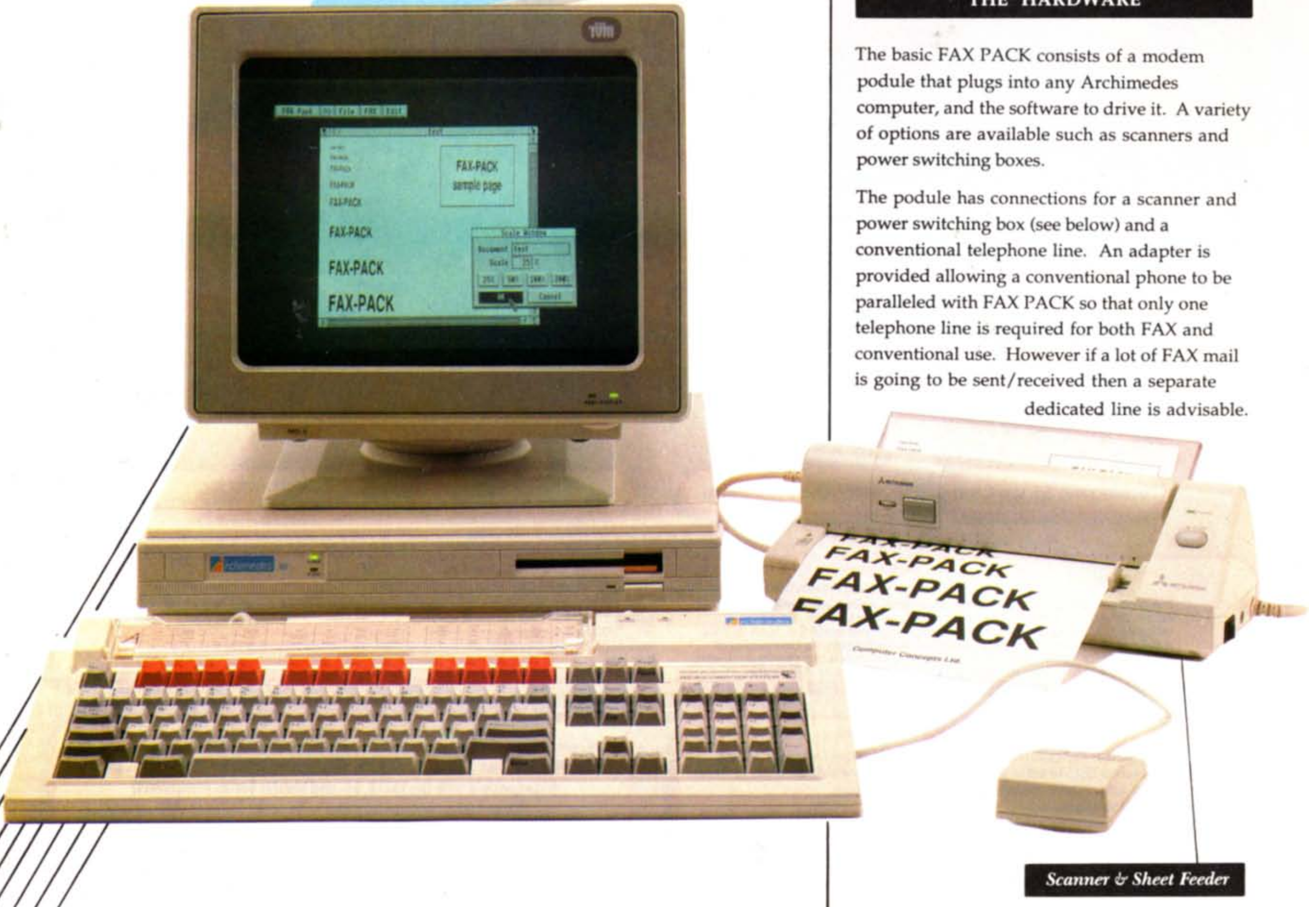
FAX PACK basically allows any document, be it printed text or graphics, or an electronic document such as a word processor file, to be sent to FAX machines anywhere in the world, in seconds. This is done by scanning (digitising) the document and then sending it digitally over a normal phone line to the receiving FAX machine which re-constructs the image and then prints it.

THE HARDWARE

The basic FAX PACK consists of a modem podule that plugs into any Archimedes computer, and the software to drive it. A variety of options are available such as scanners and power switching boxes.

The podule has connections for a scanner and power switching box (see below) and a conventional telephone line. An adapter is provided allowing a conventional phone to be paralleled with FAX PACK so that only one telephone line is required for both FAX and conventional use. However if a lot of FAX mail is going to be sent/received then a separate dedicated line is advisable.



Scanner & Sheet Feeder

Unlike many normal FAX machines the hardware also provides both auto-answer and auto-dial facilities making it convenient and allowing completely automatic operation without human intervention.

THE SOFTWARE

As part of FAX PACK this not only provides all the basic mechanisms for communicating with FAX machines but also includes high level WIMP based facilities for viewing FAXes on screen within a window, where they can be pixel edited, scaled, cropped,printed, etc.

This WIMP based software is simplicity itself to use so FAX PACK can be used in the office by staff with little or no computer experience. Of course unlike any conventional FAX machine FAXes can be viewed on screen, or filed away on disc for future reference without ever getting onto paper.

The software also allows text, word processed files, even graphics, to be automatically converted to a suitable FAX format for sending to other FAX machines. The paperless office becomes closer to reality since it is now possible to write articles, documents or letters and then send these directly to remote machines without involving paper.

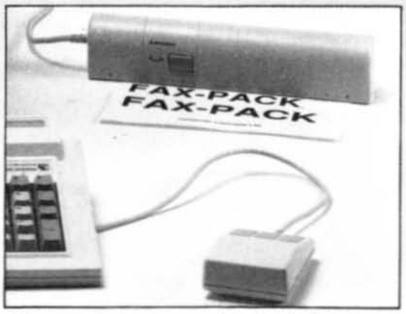
However facilities are also included for printing FAXes to a range of 9 and 24 pin dot matrix, inkjet and laser printers.

SUPER FAST MODEM

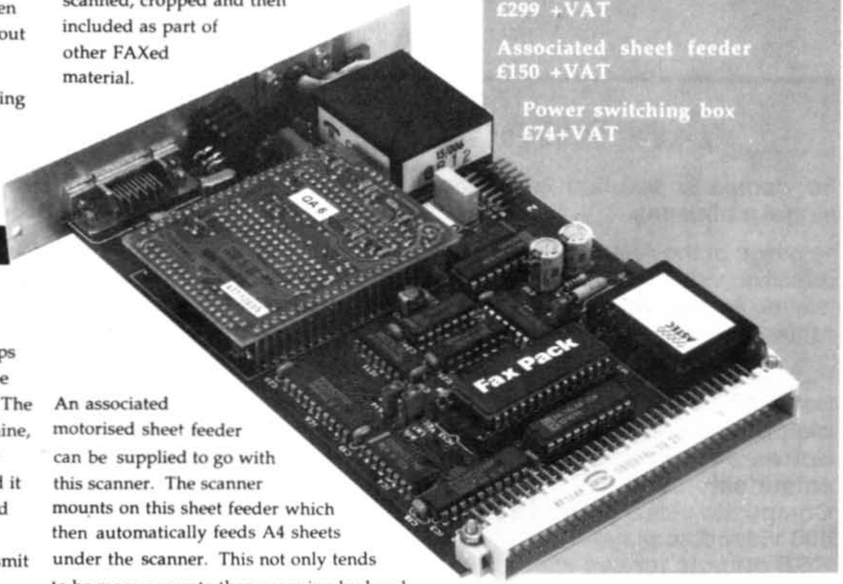
The FAX podule actually consists of a 9600 bps auto-answer, auto-dial modem, and so can be used for much more than just FAX transfer. The software can detect the type of remote machine, and if it finds a similarly equipped computer (rather than a FAX machine) at the other end it can then transfer ANY file fully error checked and glitch free. And by using some very advanced transmission protocols it can transmit data 4 times faster than most conventional modems on normal telephone lines.

THE SCANNER

In order to send printed material it is necessary to digitise the page. An optional hand-held, A4 width, 200 dpi scanner can connect to the FAX podule. Being hand-held it is not only supremely compact, but it can digitise complete A4 pages, or pages from books or other awkward shaped documents.



Of course images scanned in this fashion are not only useful for FAX purposes but also for inclusion in word processor or desk top publishing programs. FAX PACK software allows company logos and signatures to be scanned, cropped and then included as part of other FAXed material.



An associated motorised sheet feeder can be supplied to go with this scanner. The scanner mounts on this sheet feeder which then automatically feeds A4 sheets under the scanner. This not only tends to be more accurate than scanning by hand, but is also more convenient.

AUTOMATIC POWER SWITCH

This external power switching box can automatically switch the computer on in order to answer incoming FAXes. The FAX podule can then answer the phone, receive the FAX and file it to disc, and then switch the computer off again. The computer can therefore be switched off and left completely unattended for very long periods of time.

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◀ From Page 54

```
 2050 SWI OS_WriteI+ASC(" ")
 2060 MOV r0,r5:BL chwr
 2070 MOV r0,r5,LSR # 8:BL chwr
 2080 MOV r0,r5,LSR #16:BL chwr
 2090 MOV r0,r5,LSR #24:BL chwr
 2100 SWI OS_WriteI+ASC(" ")
 2110 SWI OS_WriteI+ASC(":")
 2120 SWI OS_WriteI+ASC(" ")
 2130 MOV r0,r5:ADR r1,buffer:MOV r2,#20
 2140 SWI "OS_ConvertHex8"
 2150 MOV r0,r10:SWI "OS_Write0"
 2160 LDMFD (stack)!,{pc}
 2170 .chwr:AND r0,r0,#&FF
 2180 CMP r0,# 31:MOVLE r0,#ASC(".")
 2190 CMP r0,#127:MOVEQ r0,#ASC(".")
 2200 SWI "OS_WriteC":MOV pc,link
 2210 .buffer:EQUS STRING$(20," ")
 2220 ]:NEXT:ENDPROC
 2230 DEF PROCplaque(txt$,X%,Y%,txtcol)
 2240 W%=LEN(txt$)
 2250 MOVE 16*X%-8,1032-32*(Y%-1)
 2260 MOVEBY0,-48:GCOL lightblue
 2270 PLOT 81,16*(W%+1),48
 2280 MOVEBY0,-4:MOVEBY-16*(W%+1),-44
 2290 GCOL darkblue
 2300 PLOT 85,16*(X%+W%)+8,1016-32*Y%
 2310 GCOL midblue:RECTANGLE FILL 16*X%-
4,1020-32*Y%,16*W%+8,40
 2320 COLOUR txtcol:PRINTTAB(X%,Y%-1)txt
$
 2330 COLOUR white:ENDPROC
 2340 DEF PROCplaqueupdate
 2350 PROCvalidate(mem%)
 2360 IF goodmem% THEN
 2370 IF branch% COLOUR brcol,7 ELSE COL
OUR brcol,0
 2380 IF adrtype% COLOUR adrcol,7 ELSE C
OLOUR adrcol,0
 2390 ELSE
 2400 COLOUR brcol,0:COLOUR adrcol,0
 2410 ENDIF
 2420 IF sptr%=-1 THEN
 2430 COLOUR sbrcol,0
 2440 COLOUR sbrmess,80,80,208
 2450 ELSE
 2460 IF (LEFT$(inst$,3)="LDM" AND INSTR
(inst$,"PC")>0) OR (LEFT$(inst$,3)="MOV"
 AND MID$(inst$,9,2)="PC") COLOUR sbrcol
,7 ELSE COLOUR sbrcol,128,128,128
 2470 IF mem%<lstsbr%(sptr%) COLOUR sbrm
ess,7 ELSE COLOUR sbrmess,80,80,208
 2480 ENDIF
 2490 IF nummrks%>0 COLOUR edmrcol,7 ELS
E COLOUR edmrcol,0
 2500 ENDPROC
 2510 DEF PROCmsg(text$):VDU 26
 2520 COLOUR white
 2530 PRINTTAB(2,30)text$;STRING$(77-LEN
(text$)," ");
 2540 VDU 28,1,23,78,1:ENDPROC
 2550 DEF PROCmessclear:VDU 26
 2560 COLOUR sbrmess:COLOUR 128+midblue
 2570 PRINTTAB(2,30)"Caution - moved pas
t start of lst subroutine"+STRING$(32,"
")
 2580 COLOUR white:VDU 28,1,23,78,1
 2590 ENDPROC
 2600 DEF FNonscreen(addr%)=((addr%>=mem
%-4*actln%) AND (addr%<=mem%-4*actln%+88
))
 2610 DEF PROCgoto(tgt%)
 2620 IF FNonscreen(tgt%) THEN
 2630 PROChighlightln
 2640 actln%+=(tgt%-mem%)/4:mem%=tgt%
 2650 PROChighlightln
 2660 ELSE
 2670 PROChighlightln
 2680 actln%=11:mem%=tgt%:PROCnewscreen(
mem%-4*actln%-4)
 2690 ENDIF
 2700 ENDPROC
 2710 DEF FNsafeeval(A$)
 2720 LOCAL ERROR:ON ERROR LOCAL =-1
 2730 =EVALA$
 2740 DEF FNADRcalc
 2750 offset%=EVALMID$(inst$,INSTR(inst$
,"#")+1)
 2760 IF LEFT$(inst$,3)="ADD" =mem%+8+of
fset% ELSE =mem%+8-offset%
 2770 ENDPROC
 2780 DEF FNsafeinput
 2790 LOCAL ERROR:ON ERROR LOCAL =""
 2800 INPUTTAB(2+LEN(gm$),30)""adr$
 2810 =adr$
```

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No more 'No room'

Paul Dellar shows how to avoid reconfiguring when changing size

HAVE you ever had the problem of trying to load a module while in Basic and getting the annoying *No room in RMA* error? Yet doing the same from the Arthur prompt is perfectly OK? Well here are three utilities that will let you change the size of the RMA, screen and font cache from any application.

Unlike the 8 bit BBC Micros, the Archimedes' physical memory is divided into a number of separate sections in the 32 Mb of the logical memory map for the screen, relocatable module area – RMA – sprites and so on. The amount of memory in each area is set by the Cmos ram configuration after switch-on or a hard reset, which makes it very difficult for a program to set up the micro's memory automatically to suit itself.

Some commercial applications save the Cmos ram, alter it, simulate Control+Break, reboot and then restore the Cmos ram to its original state. This is very messy and won't work with a hard disc – but there is an easier way.

When you load a module from the Arthur prompt the relocatable module manager expands the RMA – taking memory away from the application workspace using a software interrupt – SWI – called OS–ChangeDynamicArea and it can also change the amount of memory allocated to the screen and system areas.

The first two Basic programs – Screen–src and RMA–src – will assemble ARM code transient utilities called SetScreen and SetRMA which can be used at any time to change the screen and RMA ram allocations by simply typing:

```
*SetScreen <size>
```

or

```
*SetRMA <size>
```

The required size is specified in kilobytes rather than system *pages* as with CONFIGURE but it will be rounded up by the operating system into pages. If the size is missing or illegal an error message is reported.

Altering the memory map will generally need to be done from the Arthur Supervisor using a EXECed command file before starting an application because most applications, such as Basic, will veto any attempt to reduce its workspace, resulting in a *Memory in use* or similar error message.

Note that SetScreen will often clear the screen so that the VDU drivers' hardware scrolling pointers are reset correctly and that you cannot reduce the video ram below the amount required for the current mode. This, or trying to reduce the RMA too far will give an *Unable to move memory* error message.

The font cache is an area of the RMA maintained by the font manager for the buffering of

Turn to Page 60 ▶

Listing I

```
   10 REM > RMA_src
   20 REM by Paul Dellar
   30 REM (C) The Micro User
   40 DIM code% &200:link=14
   50 PROCassemble
   60 SYS "OS_File",&0A,"%.SetRMA",&FFC,
,code%,P%
   70 END
   80 DEF PROCassemble
   90 FOR pass%=0 TO 2 STEP 2
  100 P%=code%:[OPT pass%
  110 \ retrieve the parameter
  120         MOV    R0,#10
  130         SWI    "XOS_ReadUnsigned"
  140         ADRVS  R0,error
  150         MOVVS  pc,link
  160 \ read the current RMA size
  170         MOV    R0,#&01800000
  180         LDR    R0,[R0,#&0C]
  190 \ calculate the required change
  200         RSB    R1,R0,R2,LSL #10
  210         MOV    R0,#1
  220         SWI    "XOS_ChangeDynamicArea

  230         MOV    pc,link
  240 .error
  250         EQUD   0
  260         EQUS   "Syntax: *SetRMA <valu
e> where <value> is in KBytes"
  270         EQUB   0:ALIGN
  280 ]:NEXT:ENDPROC
```

✓ Get it right!

```
 10 =    0 0 | 110 =    0 4 | 210 = C6FF B
 20 =    0 0 | 120 = 70D9 7 | 220 = 5951 A
 30 =    0 0 | 130 = D192 D | 230 = AA96 1
 40 = 89DE E | 140 = B661 7 | 240 = D394 1
 50 = 126A 0 | 150 = 8037 3 | 250 = B504 D
 60 = 22FF B | 160 =    0 3 | 260 = BA11 4
 70 = FD2E 6 | 170 = 9F24 0 | 270 = CF60 C
 80 = 98A5 6 | 180 =  506 5 | 280 = 953B 9
 90 = F87C B | 190 =    0 5 |
100 = 4CB2 4 | 200 = CBAA 0 |
```

◄ From Page 59

disc-based font data files and it's claimed by the font manager module whenever it is initialised. The size of the font cache is specified in byte 134 of the Cmos ram or by CONFIGURE Fontsize in units of 4k. To alter the font size without reconfiguring, a program needs to exchange the contents of Cmos ram byte 134 with the required value, reinitialise the font manager module and then restore the old contents of the Cmos ram location.

The transient utility SetFont which is assembled by the third Basic program – Font–src – will perform all of these functions when called with SetFont <size> where <size> is again specified in kilobytes using the standard OS–ReadUnsigned format.

If for any reason an error occurs when the font manager module is reinitialised, it will be reported but the font manager will be left deleted until SetFont is used again or it is RMREINITed. Like the previous two utilities, SetFont should be called from the Arthur Supervisor because it may well need to increase the size of the RMA when claiming workspace.

Another way that you can free more space for applications is to delete any unused modules and so release their workspace. To remove modules it's not necessary to UNPLUG them and press Control+Break – RMKILL followed by RMTIDY does exactly the same job. Like SetScreen, SetRMA and SetFont this is best done from a EXECed command file which should first select the Arthur Supervisor with GOS.

The only point to watch is that RMTIDY resets all modules, including FileSwitch and the ADFS, which dismounts the disc and closes any open files so you'll need to end your EXECed file with something like:

```
*KEY0*RMTIDY|M*MOUNT|MCHAIN
"PROGRAM"|M*FX138,0,128|M
```

Finally, the new Risc OS has extended facilities so that every area of memory is completely re-configurable while programs are running, so there's no need for any messing about at all.

Listing II

```
   10 REM > Screen_src
   20 REM by Paul Dellar
   30 REM (C) The Micro User
   40 DIM code% &200:link=14
   50 PROCassemble
   60 SYS "OS_File",&0A,"%.SetScreen",&F
FC,,code%,P%
   70 END
   80 DEF PROCassemble
   90 FOR pass%=0 TO 2 STEP 2
  100 P%=code%:[OPT pass%
  110 \ retrieve the parameter
  120         MOV   R0,#10
  130         SWI   "XOS_ReadUnsigned"
  140         ADRVS R0,error
  150         MOVVS pc,link
  160 \ read the current video ram
  170         ADR   R0,vdu_block
  180         ADD   R1,R0,#8
  190         SWI   "XOS_ReadVduVariables"
  200         LDR   R1,[R1]
  210 \ calculate the required change
  220         RSB   R1,R1,R2,LSL #10
  230         MOV   R0,#2
  240         SWI   "XOS_ChangeDynamicArea
"
  250         MOV   pc,link
  260 .vdu_block
  270        EQUD   150
  280        EQUD   -1
  290        EQUD   0
  300 .error
  310        EQUD   0
  320        EQUS   "Syntax: *SetScreen <v
alue> where <value> is in KBytes"
  330        EQUB   0:ALIGN
  340  ]:NEXT pass%:ENDPROC
```

Get it right!

```
 10 =     0 0 | 130 = D192 9 | 250 = AA96 1
 20 =     0 0 | 140 = B661 6 | 260 = 447F F
 30 =     0 0 | 150 = 8037 6 | 270 = FCCA 9
 40 = 89DE E | 160 =     0 6 | 280 = B4D7 7
 50 = 126A 0 | 170 = 7B92 A | 290 = C65E 7
 60 =  A2D 1 | 180 = 1A68 D | 300 = D394 B
 70 = FD2E D | 190 = 590F 2 | 310 = C65E C
 80 = 98A5 5 | 200 = 55C0 5 | 320 = BD87 C
 90 = F87C 8 | 210 =     0 5 | 330 = 95CB 7
100 = 4CB2 8 | 220 = C8DF E | 340 = BFBD E
110 =     0 8 | 230 = F69C A |
120 = 70D9 A | 240 = 5951 F |
```

Listing III

```
   10 REM > Font_src
   20 REM by Paul Dellar
   30 REM (C) The Micro User
   40 DIM code% &200:link=14
   50 font_cmos=134:V_flag=1<<28
   60 PROCassemble
   70 SYS "OS_File",&0A,"%.SetFont",&FFC
,,code%,P%
   80 END
   90 DEF PROCassemble
  100 FOR pass%=0 TO 2 STEP 2
  110 P%=code%:[OPT pass%
  120 \ retrieve the parameter
  130         MOV   R0,#10
  140         SWI   "XOS_ReadUnsigned"
  150         ADRVS R0,error
  160         MOVVS pc,link
  170         MOV   R4,R2,LSR #2
  180 \ read the fontsize
  190         MOV   R0,#&A1
  200         MOV   R1,#font_cmos
  210         SWI   "OS_Byte"
  220         MOV   R3,R2
  230 \ set the required value
  240         MOV   R2,R4
  250         MOV   R0,#&A2
  260         MOV   R1,#font_cmos
  270         SWI   "OS_Byte"
  280 \ reinitialise the FontManager
  290         MOV   R0,#3
  300         ADR   R1,module
  310         SWI   "XOS_Module"
  320         MOV   R4,R0
  330 \ restore the R3 CMOS ram
  340         MOV   R0,#&A2
  350         MOV   R1,#font_cmos
  360         MOV   R2,R3
  370         SWI   "OS_Byte"
  380         MOVVS R0,R4
  390         MOV   pc,link
  400 .module
  410         EQUS "FontManager"
  420         EQUB 0:ALIGN
  430 .error
  440         EQUD 0
  450         EQUS "Syntax: *SetFont <valu
e> where <value> is in KBytes"
  460         EQUB 0:ALIGN
  470 ]:NEXT:ENDPROC
```

Get it right!

```
 10 =     0 0 | 170 = A7FA 0 | 330 =     0 3
 20 =     0 0 | 180 =     0 0 | 340 = 4C1D 7
 30 =     0 0 | 190 = 7C7E 5 | 350 = 38D8 6
 40 = 89DE E | 200 = 38D8 B | 360 = 30BD 7
 50 = BDCC C | 210 = 2A03 5 | 370 = 2A03 F
 60 = 126A 6 | 220 = 5628 B | 380 = C116 0
 70 =  871 A | 230 =     0 B | 390 = AA96 4
 80 = FD2E 8 | 240 = 405A D | 400 = E39F F
 90 = 98A5 D | 250 = 4C1D A | 410 = 944E 6
100 = F87C A | 260 = 38D8 7 | 420 =  893 C
110 = 4CB2 C | 270 = 2A03 B | 430 = D394 7
120 =     0 C | 280 =     0 B | 440 = AED4 5
130 = 70D9 8 | 290 = E6BD 2 | 450 = 1A7E 5
140 = D192 B | 300 = 21A9 7 | 460 =  893 9
150 = B661 9 | 310 = 1423 A | 470 = 953B 6
160 = 8037 0 | 320 = 2747 3 |
```

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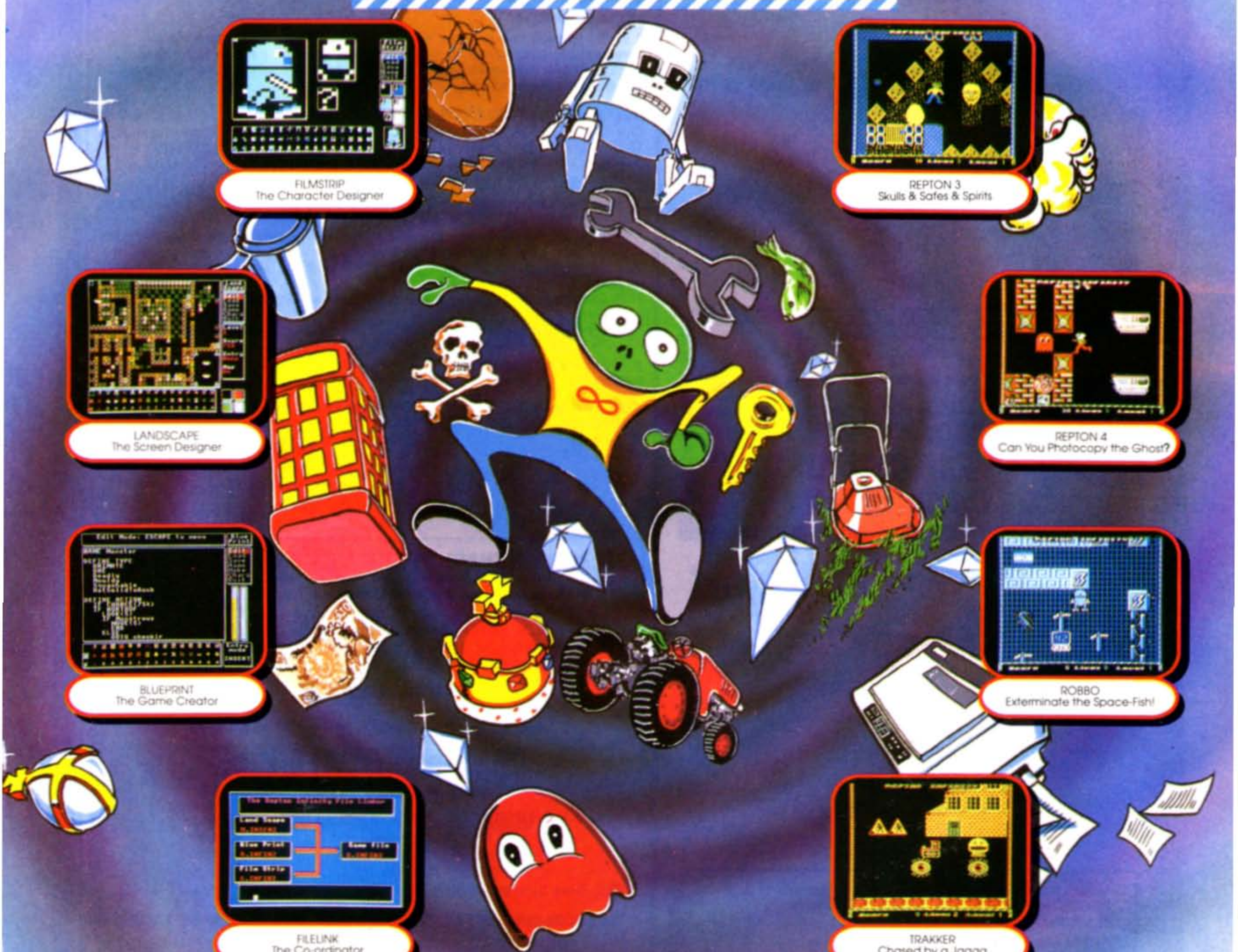

REPTON INFINITY – Featuring a Sophisticated Game Creator

The Repton series of games is the most successful set of software ever published for the BBC Micro and Electron computers; more than 120,000 Repton cassettes and discs have now been sold. Repton has been aptly described as "the thinking man's arcade game" . . . since it requires the use of clever strategy as well as pure arcade-skill.

Repton Infinity is the ultimate Repton program. You can completely redesign all of the game characters and game screens. But more than this, you can now also create a wide range of diversely different games by using a special game-creating language.

The 4 games provided (and illustrated above) give some indication of the versatility of this package:

- Repton 3 – to show you the way,
- Repton 4 – a new puzzling predicament for our hero,
- Robbo – a crazy robot in a strange topsy-turvy world,
- Trakker – with 4 animated opponents to petrify you.

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- FILE LINK – the Co-ordinator,
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- the Repton 4 game – with 8 game screens,
- the Robbo game – with 8 games screens,
- the Trakker game – with 8 game screens

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(Compatible with the BBC B, B+ and Master Series computers)

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(The screen pictures show the BBC Micro version of the game.)

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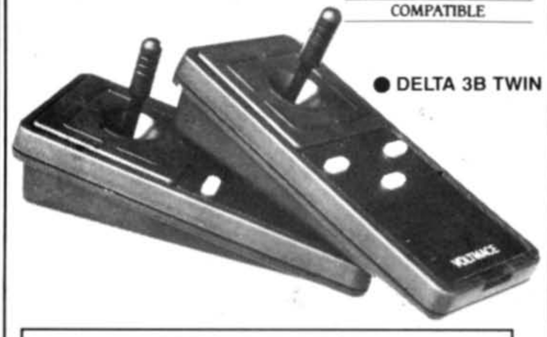

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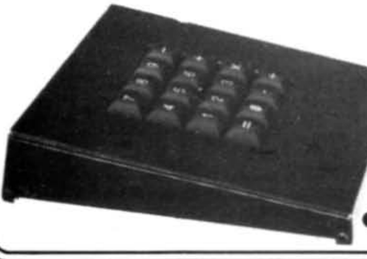
Archimedes joystick now in light grey case	
Delta 3b Single or 3b Twin	Prices as above

●DATAPRINT 2P



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Archimedes gets it right!

Paul Dellar presents a checksum generator for the Risc machine

THE Micro User checksums provide an easy way of finding your typing errors when entering magazine listings. But the generator programs published in the June 1987 and February 1988 issues both contain elements of 6502 machine code, so Archimedes users have to run them under the 6502 emulator.

Unfortunately the Basic 4 supplied with the emulator cannot be used to enter Archimedes programs because it doesn't tokenise the extra keywords – such as CASE and RECTANGLE – correctly. This makes the checksums very inconvenient for Archimedes owners to use as they need to enter the program in Basic V, save it, run the 6502 emulator, load it into Basic 4, run the checksum generator, return to Basic V, load the program again and finally – and doubtless breathlessly – correct any errors.

The accompanying routine is the source code for a checksum generator written in completely relocatable ARM code. Once typed in, save it as Check/Src and you can check it with either of the previous checksum generators in the emulator. When you run it the ARM code routine produced – Check – is best transferred to your library directory so that it can be called from wherever you happen to be in the ADFS file hierarchy.

The assembled code can either be run from disc as a transient utility by entering:

```
*Check
```

or loaded into a spare area of memory ready to be called when you need it:

```
*LOAD Check 80000
*KEY0 CALL &80000:M
```

Pressing the Print key calls the routine and produces the list of line numbers, individual line checksums and the cumulative total checksum for the Basic program in memory.

To obtain a printout use Control+B before running the program, or to prevent rapid scrolling use Control+N or Scroll Lock to page the screen. As with any machine code program operating on Basic's memory, always make sure that you have saved the Basic program first.

It came to light recently that the 6502 checksum program fails to report errors when it thinks that it has met machine code comments in DATA statements.

This new ARM code program deals correctly with this situation as well as being able to handle the difference between the open and close machine code symbols and the brackets used to hold memory addresses – both use [ ].

The code uses several operating system routines for converting numbers into strings in various formats. Details of these can be found on pages 407 and 408 of the Reference Manual and the printing routines described on pages 51 to 53. Further information on transient utilities can be found on page 353.

Due to popular demand we will be repeating our article on checksums and how to use them in the February issue of *The Micro User.*

```
   10 REM >$.Check/Src
   20 REM by Paul Dellar
   30 REM (c) The Micro User
   40 DIM code% &1000
   50 PROCassemble
   60 OSCLI("SAVE Check "+STR$~code%+" "
+STR$~O%)
   70 OSCLI("SETTYPE Check FFC"):END
   90 :
  100 DEF PROCassemble
  110 work_crc = 0:char      = 1
  120 loop     = 2:mask      = 3
  130 flags    = 4:total_crc= 5
  140 line_crc = 6:start     = 8
  150 end      = 9:line_len =10
  160 line_num =11:prog_ptr =12
  170 sp       =13:link      =14
  180 WriteI   =&100
  190 rem_token=&F4:data_token=&DC
  200 quoteflag=1<<30
  210 comntflag=1<<29
  220 data_flag=1<<28
  230 fieldlen =5:maxlen   =8
  240 FOR pass%=4 TO 7 STEP 2
  250 P%=0:O%=code%:[OPT pass%
  260 .checksum
  270       STMFD (sp)!,{link}
  280       MOV   prog_ptr,#&8F00
  290       MOV   total_crc,#0
  300       MOV   flags,#0
  310 .for_each_line
  320       SWI   "OS_ReadEscapeState"
  330       BCS   exit
  340       BIC   flags,flags,#data_flag
  350       BIC   flags,flags,#comntflag
  360       BIC   flags,flags,#quoteflag
  370       LDRB  char,[prog_ptr,#1]
  380       CMP   char,#&7F
  390       BGT   exit
  400       MOV   line_crc,#0
  410       LDRB  char,[prog_ptr]
  420       CMP   char,#&0D
  430       BNE   bad_prog
  440       LDRB  line_num,[prog_ptr,#1]
  450       MOV   line_num,line_num,LSL#
8
  460       LDRB  char,[prog_ptr,#2]
  470       ADD   line_num,line_num,char
  480       LDRB  line_len,[prog_ptr,#3]
```

Turn to Page 64 ▶

◄ From Page 63

```
490       MOV   start,#4
500       MOV   end,line_len
510 .trailing_spaces
520       CMP   end,start
530       BEQ   leading_spaces
540       LDRB  char,[prog_ptr,end]
550       CMP   char,#ASC" "
560       SUBEQ end,end,#1
570       BEQ   trailing_spaces
580 .leading_spaces
590       CMP   start,end
600       BEQ   check_loop
610       LDRB  char,[prog_ptr,start]
620       CMP   char,#ASC" "
630       ADDEQ start,start,#1
640       BEQ   leading_spaces
650 .check_loop
660       LDRB  char,[prog_ptr,start]
670       CMP   char,#rem_token
680       BEQ   no_crc
690       CMP   char,#data_token
700       ORREQ flags,flags,#data_flag
710       TST   flags,#data_flag
720       BNE   no_further_checks
730       CMP   char,#ASC(":")
740       BICEQ flags,flags,#comntflag
750       TST   flags,#comntflag
760       BNE   next_byte
770       CMP   char,#ASC("""")
780       EOREQ flags,flags,#quoteflag
790       TST   flags,#quoteflag
800       BNE   no_further_checks
810       CMP   char,#ASC("[")
820       ADDEQ flags,flags,#1
830       ANDS  flags,flags,#255
840       BEQ   no_further_checks
850       CMP   char,#ASC("\")
860       ORREQ flags,flags,#comntflag
870       TST   flags,#comntflag
880       BNE   next_byte
890       CMP   char,#ASC("]")
900       SUBEQ flags,flags,#1
910 .no_further_checks
920       MOV   work_crc,line_crc
930       BL    crc_code
940       MOV   line_crc,work_crc
 950       MOV   work_crc,total_crc
 960       BL    crc_code
 970       MOV   total_crc,work_crc
 980 .next_byte
 990       ADD   start,start,#1
1000       CMP   start,end
1010       BLT   check_loop
1020 .no_crc
1030       MOV   R0,#ASC(" ")
1040       MOV   loop,#8
1050       ADR   R1,print_buff
1060 .clear_lp
1070       STRB  R0,[R1,loop]
1080       SUBS  loop,loop,#1
1090       BGT   clear_lp
1100       MOV   R0,line_num
1110       MOV   R2,#maxlen
1120       SWI   "OS_BinaryToDecimal"
1130       MOV   R0,R1
1140       MOV   R1,R2
1150       RSBS  R3,R1,#fieldlen
1160       BLNE  printSpaces
1170       SWI   "OS_WriteN"
1180       SWI   WriteI+ASC(" ")
1190       SWI   WriteI+ASC("=")
1200       SWI   WriteI+ASC(" ")
1210       MOV   R0,line_crc
1220       ADR   R1,print_buff
1230       MOV   R2,#maxlen
1240       SWI   "OS_ConvertHex4"
1250       MOV   R1,#4
1260       BL    leadingSpaces
1270       SWI   "OS_WriteN"
1280       SWI   WriteI+ASC(" ")
1290       MOV   R0,total_crc
1300       ADR   R1,print_buff
1310       MOV   R2,#maxlen
1320       SWI   "OS_ConvertHex1"
1330       MOV   R1,#1
1340       SWI   "OS_WriteN"
1350       CMP   end,line_len
1360       SWINE WriteI+ASC("*")
1370       SWI   "OS_NewLine"
1380       ADD   prog_ptr,prog_ptr,line
_len
1390       LDRB  char,[prog_ptr,#1]
1400       CMP   char,#&7F
1410       BLE   for_each_line
1420 .exit
1430       LDMFD (sp)!,{pc}
1440 .bad_prog
1450       SWI   "OS_WriteS"
1460       EQUS  "Bad Program"
1470       EQUW  13
1480       ALIGN
1490       LDMFD (sp)!,{pc}
1500 .crc_code
1510       MOV   mask,#&FF
1520       ADD   mask,mask,#&FF00
1530       EOR   work_crc,work_crc,char
,LSL#8
1540       MOV   loop,#7
1550 .crc_loop
1560       TST   work_crc,#1<<15
1570       EORNE work_crc,work_crc,#&81
0
1580       MOV   work_crc,work_crc,LSL
#1
1590       ADDNE work_crc,work_crc,#1
1600       AND   work_crc,work_crc,mask
1610       SUBS  loop,loop,#1
1620       BPL   crc_loop
1630       MOV   pc,link
1640 .printSpaces
1650       STMFD (sp)!,{R0-R2,link}
1660       ADR   R0,spaces
1670       MOV   R1,R3
1680       SWI   "OS_WriteN"
1690       LDMFD (sp)!,{R0-R2,pc}
1700 .leadingSpaces
1710       STMFD (sp)!,{R0-R2,link}
1720       MOV   R1,#0
1730 .spacesLoop
1740       LDRB  R2,[R0,R1]
1750       CMP   R2,#ASC("0")
1760       BNE   spacesExit
1770       MOVEQ R2,#32
1780       STREQB R2,[R0,R1]
1790       ADD   R1,R1,#1
1800       CMP   R1,#3
1810       BNE   spacesLoop
1820 .spacesExit
1830       LDMFD (sp)!,{R0-R2,pc}
1840 .print_buff
1850       EQUS  STRING$(maxlen," ")
1860 .spaces
1870       EQUS  STRING$(fieldlen," ")
1880 ]:NEXT:ENDPROC
```

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 723C C
  50 = 126A D
  60 = 19B5 C
  70 = B8B7 3
  90 = 9719 0
 100 = 98A5 3
 110 = 79B0 F
 120 = 41F6 9
 130 = 926C F
 140 = 52B1 7
 150 = 58C9 2
 160 = 4FE2 4
 170 =  E95 8
 180 = FF88 2
 190 = 2238 6
 200 = 9E55 9
 210 = C9E0 E
 220 = 7A3A 7
 230 = 2E77 4
 240 = 47C4 F
 250 = AD97 3
 260 = D6D4 A

 270 = D4DF D
 280 = 7C92 4
 290 = 287F 2
 300 = CF6D A
 310 = 85B8 3
 320 = D7A6 4
 330 = 95C9 1
 340 = 5C7F 0
 350 = 4E3A D
 360 = 2505 3
 370 = C03E E
 380 = 1240 C
 390 = CE3E 0
 400 = F444 B
 410 = E031 0
 420 = AB95 6
 430 = 37A9 D
 440 = 6D55 1
 450 = 4EC6 6
 460 = 956D E
 470 = CF46 3
 480 = EADC F
 490 = 2815 0
 500 = E62D F
 510 = F9D3 9

 520 = 695B C
 530 =  980 A
 540 = E8E3 1
 550 = F829 3
 560 = F18D 2
 570 = 30AF A
 580 = FA96 4
 590 = 5AB6 C
 600 =  149 2
 610 = D8B0 4
 620 = F829 3
 630 = 991F F
 640 =  980 7
 650 = 54D4 0
 660 = D8B0 E
 670 = CF79 0
 680 = DF54 C
 690 = BBB0 6
 700 = 67A2 6
 710 = 89B4 8
 720 = 2EA9 F
 730 = BBE8 E
 740 = B37C 7
 750 = 9BF1 D
 760 = 2B79 D

 770 =  965 A
 780 = B9AA C
 790 = F0CE 1
 800 = 2EA9 E
 810 = 17B3 0
 820 = A3F7 9
 830 =  FD5 A
 840 = 2F14 F
 850 = 9223 A
 860 = 75E7 D
 870 = 9BF1 E
 880 = 2B79 9
 890 = A513 7
 900 = 4D64 C
 910 = 3CC3 6
 920 = 2FE7 B
 930 = 1DB4 2
 940 = C1EB F
 950 = 93E0 0
 960 = 1DB4 F
 970 = 8EAD D
 980 = 602A C
 990 = CF61 F
1000 = 5AB6 0
1010 =  E34 E

1020 = AEF0 2
1030 = 5AE1 0
1040 = 8811 1
1050 = 2E8F D
1060 = 3291 E
1070 = 61A4 B
1080 = 18C5 0
1090 = 78F0 4
1100 = B17E 5
1110 = EB08 5
1120 = 1C4C 2
1130 = FD97 B
1140 = BB40 A
1150 = E446 4
1160 = 53C1 F
1170 = AEDD 0
1180 = B1F5 8
1190 = B0C7 1
1200 = B1F5 E

1210 = 8B76 E
1220 = 2E8F 7
1230 = EB08 2
1240 = 5674 F
1250 = E0EE A
1260 = 8EB1 6
1270 = AEDD E
1280 = B1F5 0
1290 = F78E 5
1300 = 2E8F 1
1310 = EB08 3
1320 = A981 B
1330 = B04B 8
1340 = AEDD 0
1350 = F6D9 2
1360 = EF65 0
1370 =  ECD 7
1380 = 8E10 A
1390 = C03E 0

1400 = 1240 C
1410 =  2E6 4
1420 = DC83 7
1430 = C378 8
1440 =  7D4 F
1450 = DBF2 B
1460 = 6627 A
1470 = 2CF7 C
1480 = 24FA 3
1490 = C378 7
1500 = 1A4E 0
1510 = 8E2F E
1520 = 31E7 E
1530 = E968 B
1540 = 79FE A
1550 = 50CE 3
1560 =  CE1 D
1570 = AAB7 B
1580 = 5A1F 4
1590 = ECC1 0
1600 = F666 0
1610 = 18C5 1
1620 = EAEB 6
1630 = AA96 8
1640 = 5CDC 9

1650 = 5BC5 C
1660 = 1817 9
1670 = AB61 F
1680 = AEDD 7
1690 =  5E8 1
1700 = 1E83 C
1710 = 5BC5 5
1720 = A06A 6
1730 = 815C B
1740 = 6092 3
1750 = 4865 F
1760 = F455 2
1770 = 4242 7
1780 = 4735 D
1790 = FDF5 5
1800 = 4771 D
1810 = 2BF3 5
1820 = 5EFA 8
1830 =  5E8 3
1840 =  746 F
1850 = A7EE A
1860 = 9DF2 0
1870 =  AC0 E
1880 = 953B A
```

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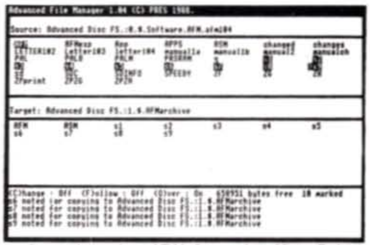
The ultimate 'front-end' for ADFS and DFS includes:

Menu – infinitely expandable
Delete – deletes any number of files
Rename – rename multiple files using wildcards
Copy – extremely comprehensive file copier



```
Advanced File Manager 1.04 (C) PRES 1988.
Target: Advanced Disc FS.:1.$.AFMarchive
```

Screen picture shows AFM in Copy mode on Master Turbo

AFM follows the PRES 'Master Plan' of upwards compatibility – it runs on Electron, BBC B, B+, B+128, Master 128 and Compact, with Second/Co-processors and Acorn-compatibile versions of DFS & ADFS.

AFM has four distinct modes:

MENU – allows browsing through the files and directories on a disc. Files are started from a menu of up to 7 options chosen for a selected ROM. Loaders are provided for Basic, The Basic Editor, View, ViewSheet, ViewStore, ViewSpell, Edit, Wordwise (+) and InterWord. This list can be expanded infinitely using an Acorn-approved OSWORD call... full details and example in the manual..

DELETE – allows files to be marked and then deleted with one keystroke.

RENAME – allows one or more files to be marked and then renamed using a wildcarded name, ie one which varies with each file renamed. Thus you could rename s1, s2 and s3 to be s1_old, s2_old, and s3_old in one operation... and that's only the beginning! As well as using the whole of the original name you can also pick out individual characters to form part of the new name.

COPY – the strongest feature of AFM. It is a two stage copy routine. With both source and target directories shown on screen the files to be copied are marked. Once all the files have been marked copying is started and the computer can be left to get on with it!
Large files can be split across several disks, and recombined.

As much as possible of the computer's memory is used for copying files, including unused parts of shadow screen memory, sideways ram banks (inc. AP7), ram cartridges (inc. ABR (32K) and AQR (256K)), tube memory (up to 61K), B+ paged ram (12K) and unused parts of the Slogger Master Ramboard (Electron).

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ACORN announced a new operating system for the Archimedes last September. Gone is the rather quirky name of Arthur and in its place the rather more business-like Risc OS 2.0 – Reduced Instruction Set Computer Operating System. It's too soon for a full review of the system, but here is an insight into what you might expect to see when it becomes available.

It offers considerable advantages over Arthur which must now be viewed as merely a stopgap. Acorn is very keen to make Risc OS 2.0 *the* operating system, and consider users who do not upgrade to be outside the Archimedes user community. This might sound rather high-handed but it does make very sound sense. If there were two standards in the marketplace software developers would naturally choose the least common denominator and the considerable advantages of the new system would not be exploited to the full.

Having seen it in action I wholeheartedly agree with this philosophy. Acorn's pricing policy backs up their intent, as the upgrade – available from April – will, for a limited time be sold at £29 (+VAT) and after that will resort to a price closer to its real worth – £50. Mind you, even then it represents a bargain as you get four roms, two manuals and three discs chock full of software.

What are the improvements? The main thing is that the window environment is made very much easier to use. No longer will you have to struggle with the *COPY command and its string of path names and options. All you do is use the mouse to drag an icon representing the file you want to move from the window it's in across to the window of the device you want to copy it to. If this window happens to be for a disc not already in the drive, the system will prompt you to insert it before continuing. Similarly, printing simply involves dragging your document to the printer icon.

> *Printing simply involves dragging your document to the printer icon*

The Desktop has been redesigned, with more sparing use of colours; it looks much more professional as a result. Gone, too, are the old problems with machine configuring. This is partly replaced by a Task display which shows the memory allocation of each function of the machine including the free space.

A trip to the bar

The amount of memory is represented by bars and can be changed simply by dragging them. Naturally as you allocate more memory to something like the system sprites the amount of free memory goes down by the same amount.

If you allocate memory to a ram disc, a new icon – a chip – appears on the menu bar. This then behaves like any mass storage device except that access is much quicker and, of course, you lose the information when you switch the micro off. This is very useful for storing temporary data files so that programs that access them work much faster. It is also handy for making multiple copies of a file on a single drive system, eliminating all disc swapping.

Other goodies are hidden away in the Basic. There are innumerable graphics extensions, one of which enables you to handle arbitrary curved lines by using Bezier curves. The handing of sprites is also improved and you can re-size and scale them as you plot them. The new roms are much bigger, and this is reflected in the extensions to the window operations. Nevertheless, there was not enough room to include the Basic editor, so that is now supplied on disc along with a clutch of really useful applications.

The flagship of these applications must be *Draw* which is an object drawing package that can handle straight, curved and dotted lines as well as geometrical shapes such as squares, arcs and ovals. In addition, a page may contain text and bit-mapped sprites. So you can mix text, drawing and sprites in the same program. In short this is a simple but powerful Do it all application useful for page layouts and artistic or technical drawings.

In order to create and edit the sprites used in Draw there is *Paint* which is basically an updating of the sprite editor found on the earlier systems. However it is much more powerful and allows you to use many different tools to create your sprite. You can use a single pixel pencil, a shaped brush or a spray can. In addition you can use geometrical shapes such as squares, circles and arcs.

As Paint is a multi-tasking system you can have more than one window open at a time to edit more than one sprite. The sprites can be enlarged to any size ratio so that you can work with more easily visible pixels. Once edited, they may be dragged into the Draw window, which can be open at the same time.

Edit completes the trio of major applications and is not a word processor but a text editor.

RGB Colour Monitor

However it contains facilities that should enable it to be used as a simple word processor. Its main use is to provide source files for compilers and to create a universal file system for exchanging textual information like manual up-dates.

In addition to these programs there is a collection of serious and not so serious ones. Perhaps the most amusing is the magnifying glass which produces an enlarged view of the screen contained in a magnifying glass icon. The degree of magnification can be changed by the mouse buttons and it moves smoothly around the screen.

It is unique in computer terms because it takes all the power of the ARM chip working flat out to supply this illusion. There's also the traditional sliding block puzzle and a game of patience.

Serious software

On the serious side is a moving display of CPU usage so you can spot processor intensive applications and keep track of what is happening. There is also a mail facility to allow Econet users to pass messages around the system easily. Other utilities include an alarm clock and calculator.

There are also utilities to allow a normal monitor to emulate the high resolution Mode 20, but I am not sure if this will be part of the final package. The new system will support 28 screen modes, to cater for four different types of monitor – normal, multi-sync, high resolution and the IBM VGA-type. Now system calls will allow you to design your own screen modes easily.

Acorn is preparing the way by holding a series of seminars for independent software vendors in which they are given a technical briefing on the new system and a hands on session with the team who wrote Risc OS in attendance. This is to make sure that the change over to the new system is as painless as possible.

Tests so far show a high degree of compatability, with most applications working straight off with the new system. Applications that aren't designed to be multi-tasked seem to work happily with other tasks. Where problems have occurred they tend to be minor, concerned with memory allocation and can be simply circumvented.

Acorn is also providing software writers with advanced copies of the new system on the very expensive large eprom format so that when the system is in rom there should be a host of new software to take advantage of its new facilities.

In short your problem will not be whether to upgrade or not but *when*. Risc OS is as vital to the future of the Archimedes as the mouse. I know I will have my order in on April 1 – and I'm no fool.

> “Your problem will not be whether to upgrade or not but when”

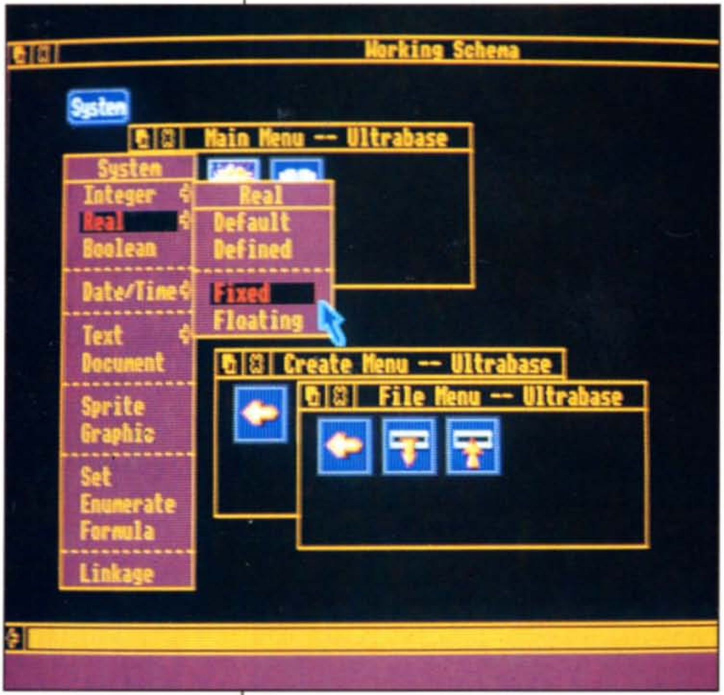
Windows, icons, menus and pointers

Kendall Down gets to grips with Wimps

THE Archimedes' Wimp Manager is a very sophisticated program which is provided with the machine. Unfortunately the programmer's reference manual, which supposedly tells you how to use it, presents so many new ideas and uses so much technical jargon that it is practically unintelligible to the average person.

Indeed, the conceptual framework of Wimp programming is totally different to the way in which ordinary programs are constructed, where the program flow is something like this:

```
REPEAT
Display menu
Select menu option
Do selected procedure
UNTIL end condition
```



A typical program that uses Wimps

You could call this a linear program. Once you have made a menu selection the program carries straight on until the procedure has been completed. You cannot select a different option until the first has been finished unless you interrupt the program flow by pressing Escape.

For example, suppose you run a small user group and keep the mailing list on micro. Imagine you're half-way through entering details for Joe Bloggs, the new member. You know he lives in the same street as Bill Smith, but can't remember the post code. So you have to abandon the entry routine, return to the menu and list all the names, re-select and re-start the entry routine.

Wimp programs are different – the full range of options are available all of the time. The DeskTop that comes with the Archimedes is a good example of this. Half-way through entering an appointment in the diary you decide to check the time by calling up the clock. Then you get the calculator to find out what 2+2 is. That calls something else to mind so you jot it down in the notepad, and while you're at it you check the catalogue of a disc before returning to the diary and completing your entry.

This series of articles will take you, step by step, through the process of writing a program using Wimps. Although the application we'll develop is for simple accounting and may not be much use to you itself, along the way you'll build up a library of Wimp routines which you can incorporate with the minimum of changes into your own software. The program is divided into three parts. First are the Wimp routines occupying line numbers less than 5000 and the third part consists of the accounting program itself numbered from 10000 upwards.

In between are procedures and functions vital to the Wimp routines but specific to the accounts program. For example, PROCmenuinit initialises the menu system and obviously has to provide options like Balance Sheet. All Wimp programs must have a procedure like this, but the specific details of the menus will depend upon the program itself.

For easy reference all procedures and functions start on lines numbered in hundreds – 100, 200, 900, 2300 and so on.

So here we go. Enter Basic, take a deep breath and type in the first line:

```
10 REM > :0.$.Money
```

One of the most convenient features of Basic V is the ability to provide a filename in the first line so all you need to do is type in:

```
SAVE
```

and your program is automatically saved under the chosen filename. Here's the next line:

```
20 MODE 12
```

The window system works best in this mode which is high resolution with 16 colours – in effect Mode 12 is a multi-hued Mode 0. Next is the error trapping:

```
50 ON ERROR PROCerror
```

This calls our familiar routine which is needed because the Wimp disables both cursor editing and the function keys. The error procedure issues a couple of FX calls to return cursor and function keys to normal. Plus, quite importantly, it makes a special Wimp Manager call to close down all windows.

Finally, so that the error message will be visible, the procedure resets VDU4 and sets the foreground and background colours:

```
4900 DEF PROCerror
4910 SYS "Wimp_CloseDown"
4920 *FX4
4930 *FX225 1
4940 VDU4:COLOUR7:COLOUR128
4950 REPORT:PRINT" at line ";ERL
4960 END
```

It is important that you type in the SYS call name exactly as shown. The Wimp Manager will not recognise either *Wimp–CLOSEDOWN* or *wimp–closedown*, and you will get the error message *SWI name not known*. Now enter:

```
40 REM *SLOAD MoneyIcons
```

Later on in the series I will give you instructions on how to produce the icons the program needs. For the moment simply type it in and ignore it. The next line is:

```
30 PROCinit
```

The initialisation procedure sets aside a number of areas of memory. Later on we will need to set aside a few more, so we'll have to add to this procedure. For the time being just enter these lines:

```
5000 DEF PROCinit
5010 DIM menublock%1300,textblock%1000,mtext%8
0,block%256,poll%32,filename%20,alertm%80
5020 *POINTER 1
5030 COLOUR12,180,150,100
5040 COLOUR13,254,180,80
5050 COLOUR15,180,180,180
5060 COLOUR143:CLS
5070 SYS "Wimp_Initialise"
5080 PROCmenuinit:ENDPROC
```

The Wimp Manager relies heavily on parameter blocks – areas of memory which it can read from and write to. BBC Micro users will be familiar with this concept from using osword calls where *A%* was set to the call number while *X%* and *Y%* pointed to the parameter block.

PROCinit sets up a number of blocks: One to hold the menu data, one to hold the window data and the third for the routine that polls – tests – what is going on. Other areas of memory are set aside for user input. Because we will be using the mouse we have to turn the pointer on with the command in line 5020.

The Basic V COLOUR command has four parameters – of which three are optional – after it:

```
COLOUR n,r,g,b
```

Here *n* stands for the colour number and the other three variables stand for red, green and blue. Only the top four bits of these three numbers are significant, which means that numbers less than 15 have no meaning. As they are 8 bit numbers, numbers greater than 255 are also meaningless.

You can use the ColourSet routine from the November 1988 issue of *The Micro User* to select your own colours if you don't like the ones in the program. For some odd reason, when you clear a menu or window from the screen it leaves behind a rectangle in colour 15. So we've re-defined colour 15 as mid-grey and in line 5060 we set the background colour to 143 – 15+128 – and clear the screen to that. You can omit this line at first if you want to see the effect.

The next step is to tell the Wimp Manager that we will be using its services – achieved by calling the routine *Wimp–Initialise*. Again note the precise spelling and the underline character.

PROCinit calls PROCmenuinit, a procedure that sets up the string variables that make up the menu system:

```
5200 DEFPROCmenuinit
5210 subsub$="3Sub-submenu|Subsub1|Subsub2|Sub
sub3|"
5220 sub1$="2Submenu|.Suboption 1|[subsub$]Sub
option 2|"
5230 sub2$="1Text Input|"mtext%,20|"
5240 menu$="4Choices|//Option1|[sub1$].Option 2
|[sub2$].:Option 3|#Option 4|"
5250 j%=FNcreatemenu(menublock%,menu$)
5260 ENDPROC
```

Each string variable is made up as follows:

- A single digit number giving the number of options available in this menu. If nine is not enough you will have to alter the program to accept double digit numbers.
- The title of the menu or submenu ending |.

Turn to Page 70 ▶

> One of the most convenient features of Basic V is the ability to provide a filename in the first line

◄ *From Page 69*

- The different menu options, each ending |.

For the present none of the menu options may be more than 11 characters in length, and the program leaves it up to you to make sure that this is so. Although longer names will not cause an error they will be clipped.

You will notice that there are also other symbols. For example, Option 1 in line 5240 is preceded by an @ – which can be found above the 2. The different symbols have a meaning when we come to create the menu. This one means that the particular option is disabled and cannot be selected.

Variable names such as *sub1$* are included in the main variable *menu$* enclosed within square brackets – [..]. This tells the program that there is a submenu from this option and tells it what the submenu variable is.

You can call for text entry from the menu using the ↑ symbol and when the program comes across this it tells the micro to make an input box and look for the input in the area of memory with the name that follows. The second number is the maximum length of the text string.

In the example given here the area of memory is called *mtext%*. Before calling for the menu you can set this to give a null or default string.

Another possibility is to put a tick next to an item – using # – and although this is just cosmetic it can indicate which items on the menu are currently selected.

There is another choice allowing you to have a dotted line dividing one part of the menu from the next. Simply put a colon – : – before the option name to inform the menu decoder that the dotted line comes after it.

Again, this does nothing to the program, it's just a question of layout.

As you will see later on, it's possible to change the menu while the program is running. You may want to place a tick against a different option, or make different ones selectable or non-selectable. The easiest way of doing this is to replace one symbol with another and for this purpose there is a null symbol provided, the full stop. If you are sure that you are not going to change anything you can leave this out, otherwise include it just in case.

The order of the symbols is important, they should be:

```
[.@#:^
```

otherwise one or more will be ignored.

So let's look at the function that does the hard work of creating a menu and it's accompanying submenus:

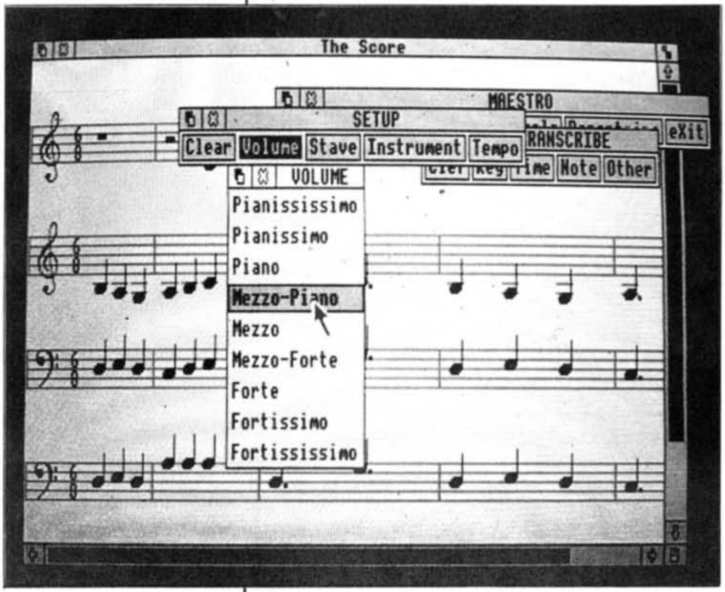
```
1200 DEFFNcreatemenu(mb%,t$)
1210 LOCALnew$,ptr%,shade%,tick%,dotted%,subme
nu%,writeable%
1220numofitems%=VALLEFT$(t$,1):t$=MID$(t$,2)

1230 nextmenu%=mb%+28+24*numofitems%
1240 $mb%=LEFT$(t$,INSTR(t$,"|"-1):t$=MID$(t$,
INSTR(t$,"|")+1)
1250 mb%?12=12:REM Title f/ground colour
1260 mb%?13=13:REM Title b/ground colour
1270 mb%?14=0:REM Work area f/ground
1280 mb%?15=7:REM Work area b/ground
1290 mb%!16=200:REM Menu width
1300 mb%!20=40:REM Height of text
1310 mb%!24=10:REM Space tween lines1320 ptr%=
mb%+28
1330 REPEAT:shade%=0:tick%=0:dotted%=0:writeab
le%=0:submenu%=-1
1340 IFLEFT$(t$,1)="["THEN
1350 t$=MID$(t$,2):new$=EVALLEFT$(t$,INSTR(t$,
"]")-1)
1360 t$=MID$(t$,INSTR(t$,"]")+1):submenu%=FNcr
eatemenu(nextmenu%,new$)
1370 ENDIF
1380 IFLEFT$(t$,1)="."t$=MID$(t$,2):REM Do not
hing
1390 IFLEFT$(t$,1)="*"shade%=&400000:t$=MID$(t
$,2)
1400 IFLEFT$(t$,1)="#"tick%=1:t$=MID$(t$,2)
1410 IFLEFT$(t$,1)=":"dotted%=2:t$=MID$(t$,2)

1420 IFLEFT$(t$,1)="^"writeable%=4:t$=MID$(t$,
2)
1430 g%=INSTR(t$,"|")
1440 IFwriteable%THEN
1450 i%=INSTR(t$,","):ptr%!12=EVALLEFT$(t$,i%-
1):t$=MID$(t$,i%+1)
1460 ptr%!16=-1
1470 ptr%!20=EVALLEFT$(t$,INSTR(t$,"|")-1)
1480 mb%!16=FNgreater(mb%!16,4+16*ptr%!20):REM
 Width of new menu
1490 ELSE
1500 $(ptr%+12)=LEFT$(t$,g%-1)
1510 ENDIF
1520 t$=MID$(t$,g%+1)
1530 !ptr%=tick%ORdotted%ORwriteable%OR(&80 AN
D(t$="")):REM&80 marks last item
1540 ptr%!4=submenu%
1550 ptr%!8=&10021ORshade%ORwriteable%<<6OR0<<
24OR7<<28
1560 ptr%+=24
1570 UNTILt$=""
1580 =mb%
```

Each menu or sub-menu starts off with 28 bytes of information – the title of the menu, the colours to use, how wide the menu is to be, and so on. The REM statements tell you what each one is for.

Line 1220 is the one to change if you want to



Windows can overlay screen information

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310		912.24	76.24	440		2762.93	232.93
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◄ *From Page 70*

have a double digit number of options, as follows:

```
numofitems%=VALLEFT$(t$,2):t$=MID$(t$,3)
```

In this case, single digit numbers will have to take the form 01, 02 and so on.

Following these 28 bytes are a number of chunks of 24 bytes – one for each option. Because you can have a hierarchical menu structure, with each option – potentially – leading to another menu, we need to know how many we should set aside for a particular menu or submenu, hence the number at the start of each string.

Each chunk contains information that the Wimp Manager needs to know given by the various codes already discussed. Notice the recursion in line 1330 where the value of *submenu%* is calculated by calling FNcreatemenu again.

In line 1390 *shade%* is set to &400000. The flag which contains information about various aspects of the menu option is identical to the icon flag and is a 32 bit word – a four-byte integer. Whether or not an option is shaded and disabled is decided by bit 22 of this flag word.

Full information about the icon flag can be found on pages 451 and 452 of the Programmer's Reference Manual. Trying to calculate it all with pencil and paper is a nightmare but fortunately there is an easier way.

Next month I will give you another utility procedure to calculate the icon flag number. It wouldn't help you now because FNcreatemenu sets all the flags you need, but it becomes very useful when we come to consider icons.

Line 1480 sets the width of the input box to the width of the main menu or to the length of the expected string, whichever is greater, using the function:

```
2800 DEFFNgreater(a%,b%):IFa%>b%=a%ELSE=b%
```

The Wimp knows that it is dealing with the final 24 byte chunk when it finds that the top bit of the first byte is set. That is why &80 is included in the equation in line 1530.

The number &10021 in line 1550 sets three bits in the flag word. The first – bit 0 – tells the Wimp that this icon contains text. The second – bit 5 – signals that the icon has a filled background. The third, which includes bits 16-20, sets the menu icons to be part of the same Exclusive Selection Group – ESG.

If the ESG number is zero each option or icon is regarded as being in a group of its own. Any other number – up to a maximum of 15 – sets the icon to be part of a particular group. As the mouse pointer moves over an option in the ESG the Wimp Manager automatically inverts it and restores all other members of the ESG to their normal colours.

But we still cannot display our menu on screen. To do that we must set up the very heart of any Wimp program:

```
60 REPEAT:whatnext%=FNpoll(0):PROCaction(whatn
ext%):UNTILFALSE
```

Here the Wimp Manager is repeatedly interrogated to find out what the user wants to do next using FNpoll which is able to mask out certain actions. In this example program everything is allowed so the mask is zero:

```
100 DEFFNpoll(mask%):SYS"Wimp_Poll",mask%,poll
%TOresult%:=result%
```

One of the useful features of Basic V is the SYS command, which takes the place of the CALL or USR command. If the keyword TO occurs following SYS the result of the machine code call is placed in the named variable/s. Each succeeding variable named is assigned the value of a register starting from R0.

Depending on the value passed to it, PROCaction calls for certain procedures which are the same, no matter what program is running. If the value is 6 it is a signal that one of the mouse buttons has been clicked:

```
200 DEFPROCaction(event%)
210 CASEevent%OF
280 WHEN6:PROCmousebuttonclick
320 ENDCASE
330 ENDPROC
```

As you can guess from the line numbering, *event%* can take more values than 6, but as that is the result returned by FNpoll when you click a mouse button that is the only one we are interested in at the moment. And so to the final procedure for this month:

```
2600 DEFPROCmousebuttonclick:LOCALhandle%,butt
on%,icon%
2610 button%=poll%!8
2620 handle%=poll%!12
2630 icon%=poll%!16
2640 mousex%=!poll%:mousey%=poll%!4
2650 IFbutton%=2$mtext%="Default":SYS"Wimp_Cre
ateMenu",0,menublock%,mousex%,mousey%
2700 ENDPROC
```

The contents of the memory block *poll%* vary depending on what value *event%* takes. When a mouse button has been clicked, *poll%* is set out as above.

The variable *button%* tells you which mouse button or combination of buttons was pressed, *handle%* refers to the window handle. I'll tell you what that means when we get on to discussing windows but for the moment it will always be –1 because there are no other windows on the screen – a menu is a specialised form of window.

The value of *icon%* is the number of the icon under the mouse pointer and, again, there'll be more explanation of this when we talk about icons in detail. Line 2640 simply tells the program where the mouse is pointing in ordinary screen coordinates.

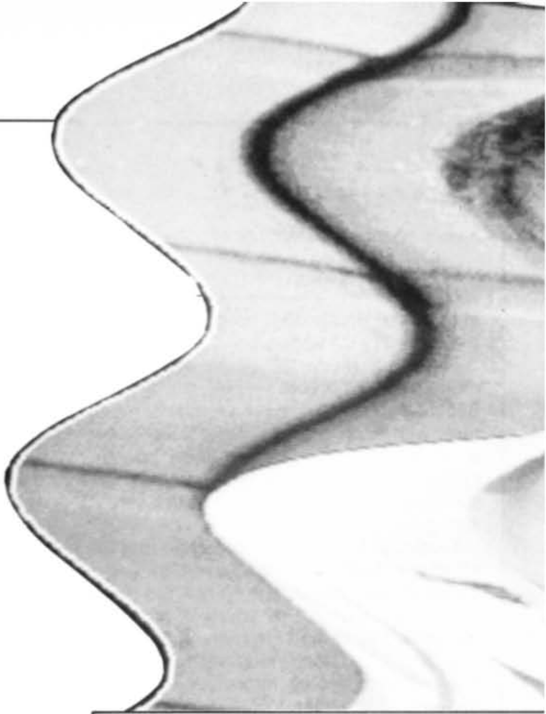
If you have pressed the middle button, which is the menu one, we set *mtext%* to hold the string *Default* and then call the Wimp Manager to create the menu with its top left corner at the position defined by *mousex%* and *mousey%*.

So that's all there is to it: You should now have a menu appearing on the screen whenever – and wherever – you press the menu button on your mouse. Of course you can't do anything with this menu yet – clicking on any of the options simply causes the menu to disappear.

> *You should now have a menu appearing on the screen whenever you press the menu button on your mouse*

● *Make sure you get next month's issue when we'll look at how to decode clicks on the menu. Until then, why not try playing around, altering the colours of your menu or putting different options in the menu variables?*

Product: Archimedes Video Digitiser
Price: £286.35
Supplier: Watford Electronics
Tel: 0923 37774



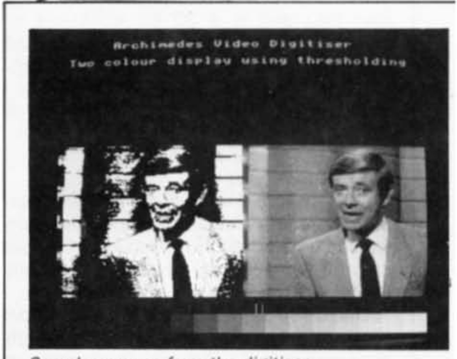
ANYONE who has been to an Electron and BBC Micro User Show since the launch of the Archimedes will have seen the Watford Video Digitiser doing its thing. I am sure that all who have seen it have been impressed by its results, especially when demonstrated by its creator Mike Harrison. He has exploited the speed and power of the Risc chip to produce some real time image manipulation routines that have previously only been possible on equipment costing about a hundred times the price of the Archimedes.

The trick lies in the fact that the Archimedes can replace some of the necessary hardware needed for a digitiser of this type by simple interrupt-driven background tasks. This helps keep the cost to reasonable proportions and produces a very compact system.

The monochrome image is digitised to a resolution of 512 by 256 pixels with six bits being allocated to each pixel. Having six bits per pixel allows 64 different grey shades – much better than can be seen using the standard colour monitor that comes with the Archimedes. The best this can do is 16 shades of grey which looks a lot better than it sounds but for the best quality work you need a monochrome monitor.

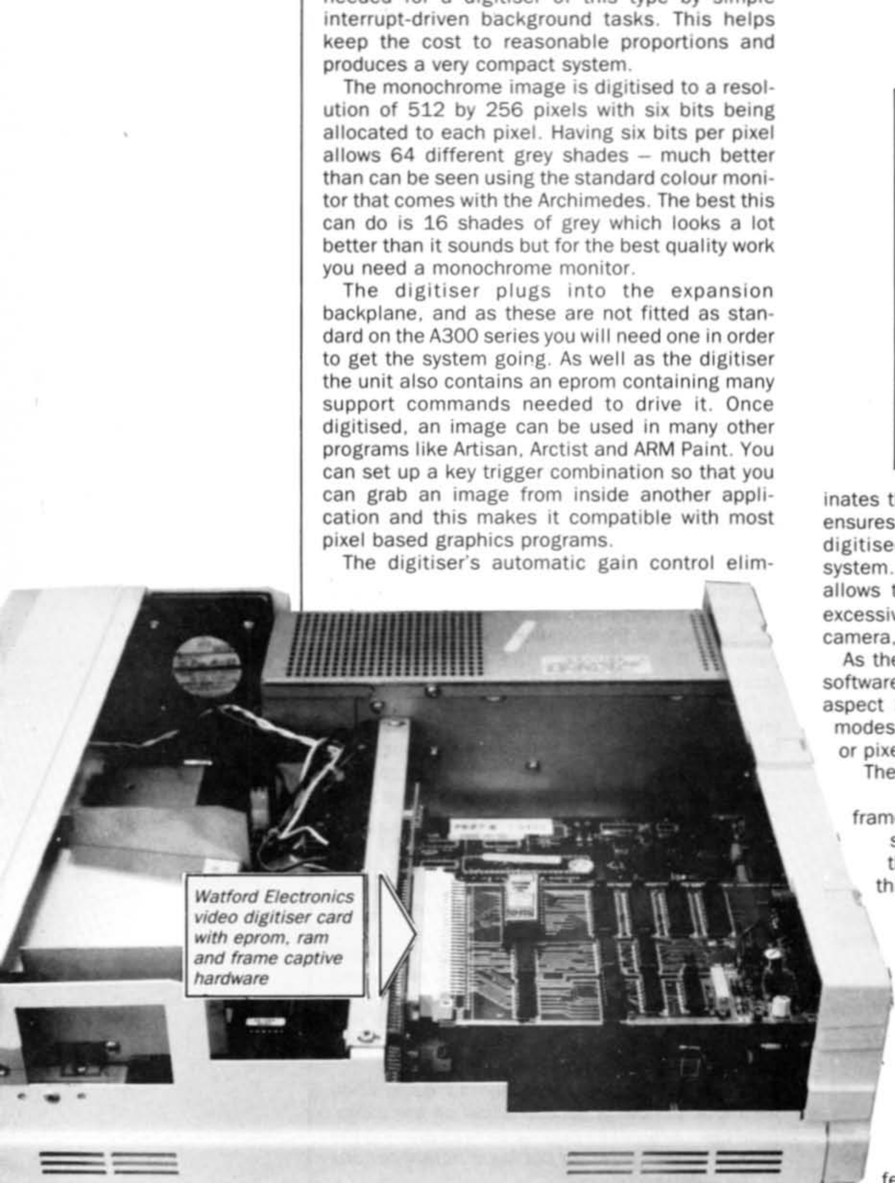
The digitiser plugs into the expansion backplane, and as these are not fitted as standard on the A300 series you will need one in order to get the system going. As well as the digitiser the unit also contains an eprom containing many support commands needed to drive it. Once digitised, an image can be used in many other programs like Artisan, Arctist and ARM Paint. You can set up a key trigger combination so that you can grab an image from inside another application and this makes it compatible with most pixel based graphics programs.

The digitiser's automatic gain control eliminates the need for input level adjustments and ensures that the video signal is always being digitised over the full dynamic range of the system. Also a colour sub carrier notch filter allows the use of colour signal inputs without excessive patterning. Signals can be taken from a camera, video recorder or TV tuner.



Archimedes Video Digitiser
Two colour display using thresholding

Sample screens from the digitiser



Watford Electronics video digitiser card with eprom, ram and frame captive hardware

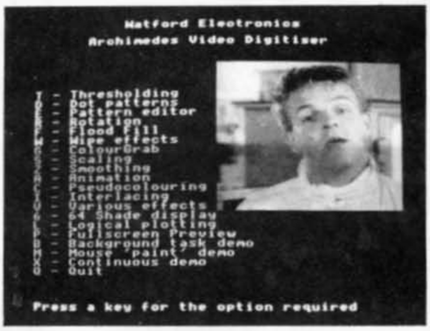
As the digitised image resolution is fixed, the software scales the image to achieve the correct aspect ratio in the many different Archimedes modes. This is done by zero order interpolation or pixel repeating.

The digitiser will work in real time, grabbing an image in the time taken for one TV frame scan. This it stores in its own memory, so to get another frame it has to transfer the first image to the micro's memory. As this takes some time, you can only display full screens of digitised images in the 16 shade mode at a rate of 12.5 a second. If you are using a quarter screen size this is boosted to 25 frames a second, which is fast enough for all but the most demanding research projects.

All the VDU calls, options and utilities are adequately described in the 77 page manual. It was especially refreshing to see that this also contained an index. However, I will briefly describe a few of the tricks the digitiser can perform.

Party tricks for the Archimedes

Mike Cook puts Watford's Video Digitiser for the Archimedes through its paces



```
          Watford Electronics
      Archimedes Video Digitiser

T - Thresholding
D - Dot patterns
E - Pattern editor
R - Rotation
F - Flood Fill
W - Wipe effects
G - ColourGrab
S - Scaling
Z - Smoothing
A - Animation
C - Pseudocolouring
I - Interlacing
V - Various effects
6 - 64 Shade display
L - Logical plotting
P - Fullscreen Preview
B - Background task demo
M - Mouse 'paint' demo
X - Continuous demo
Q - Quit

Press a key for the option required
```

The demo program on the accompanying disc which puts the digitiser through its paces, has been the talking point of many shows. Images are rotated, scaled and bounced about the screen. There are many different ways to wipe from one image to the next and the centre screen shows a live image while all around are smaller pictures of past samples. Pictures are poured into ovals, rectangles and all manner of shapes as well as sequences being repeatedly replayed backwards and forwards – a sort of video rap.

The images can be given false colours and threshold sliced. The demo continues at a cracking pace, but there is also a mode to allow you to select just the effects you want.

The Watford Digitiser has more tricks up its sleeve. If the image is stationary it can grab an interlaced image of 512 by 512 and there is a routine to allow you to see it on normal non-multi sync monitors. If you have coloured filters you can make three successive frame grabs through a red, green and blue filter to make a colour image. Other routines allow you to correct the colour balance to produce a most acceptable result.

There are two image processing commands: *SMOOTH produces a nearest neighbour low pass filter to reduce noise and give a soft feel to the picture, while the amusingly named *ZIT will eliminate impulse noise in the form of isolated pixels.

Those who want to use a more extensive range of image processing operations will be pleased to know that the public domain AIM package also supports the Watford digitiser directly. It was produced by the Department of Physics at Delft University in the Netherlands and, best of all, it is free. Although this software will only run with a Mode 20 monitor, it offers a range of powerful operations like histogram equalisation, filtering and edge detection.

Grabbed images may be printed on Epson FX, MX and LQ type printers with the grey scale represented by dot patterns which you can select.

If you are at all interested in digitised images on the Archimedes this is a must. The power and versatility of the Archimedes coupled with Watford's Digitiser are very impressive. There is potential both for fun and serious applications and a set of built-in utilities allow you easily to explore the world of digital image processing.

If you would like a copy of the AIM public domain package send a formatted disc to Musbury Consultants at the address given in the Body Building article on Page 23 together with an SAE. Bear in mind that you need a multi-sync monitor to run the software.

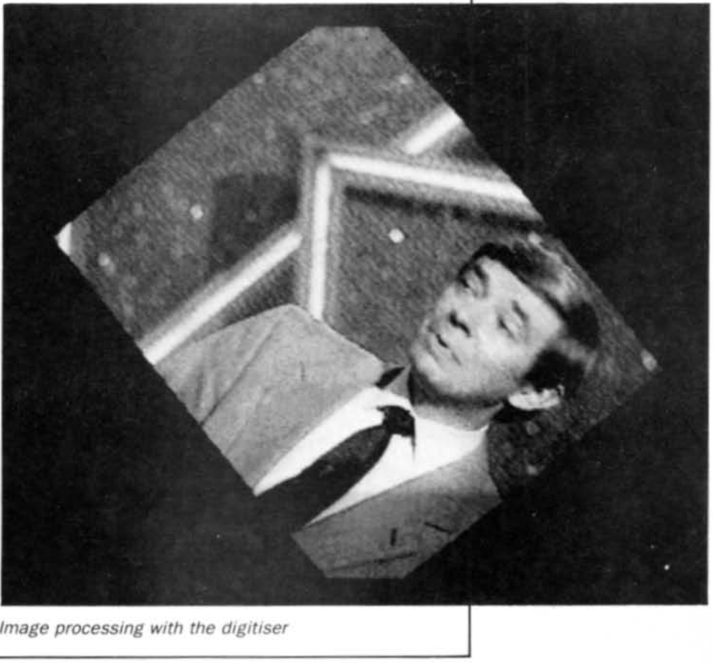


Image processing with the digitiser

Software for the Archimedes now available on disc...

Computer Concepts is now releasing new low cost DISC versions of its popular **INTER-WORD, SHEET, CHART and SPELL-MASTER products for the Archimedes.**

INTER-WORD

Inter-Word has now sold over 30,000 copies, making it one of the most popular products ever released for the BBC. The Archimedes version has several improvements including support for colour, and for the 132 column and 64 line screen modes allowing almost a complete page to be seen on screen at once. The existing features, such as auto formatting, WYSIWYG display and super fast scrolling together with these new enhancements ensure this is still one of the most effective word processors available for the Archimedes.

▽ **ARCHIMEDES DISC £29.00 + VAT**
ARCHIMEDES ROM £39.00 + VAT

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A simple to use but powerful spreadsheet. This has also been altered to take advantage of the new 132 column and 64 line screen modes allowing very large sheets to be viewed on screen. Easy to use but not lacking in facilities.

▽ **ARCHIMEDES DISC £29.00 + VAT**
ARCHIMEDES ROM £39.00 + VAT

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A chart and graph plotting program, now supporting the 256 colour screen modes which can produce impressive colour charts and graphs. An ideal complement for INTER-SHEET, although it can plot graphs from practically any data.

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ARCHIMEDES ROM £25.00 + VAT

SPELL-MASTER

An ideal partner for INTER-WORD. Check as you type, new intelligent guess routines, crossword solving etc. This is a native ARM product, and does not need the 6502 emulator.

▽ **ARCHIMEDES DISC £39.00 + VAT**
ARCHIMEDES ROM £51.30 + VAT

The INTER products run under the 6502 emulator but with some enhancements and other changes to suit the Archimedes. They are all compatible with the BBC versions and can load BBC files with no changes. No ROM-LINK facilities are available.

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A monitor for most micros

Mike Cook finds a better class of picture on a multi-sync model

Product: EIZO 8060S Flexscan Monitor
Price: £516.35
Supplier: Watford Electronics
Tel: 0923 37774

THE 8060S from EIZO is described as a professional monitor usable on a number of micros. Of the multi-sync type, it can accept TV signals that are not at the standard line rate of 16kH. In fact it can handle anything between 15.75kHz and 35kHz, so can be used on the Archimedes running modes 18 to 21. It will cope with IBM PGA, EGA and CGA systems as well as Olivetti M24 and M28. To top that it also has a TTL and analogue RGB input.

The 14in monitor comes in an attractive grey case with a non-glare treated screen. A switch on the front changes the display from full colour to amber or four shade levels of black and white. This allows you to placate your sense of aesthetics when using some of the more garish software offerings.

The unit is mounted on a tilt/swivel base giving free movement and allowing simple adjustment. It swivels 45 degrees to both left and right and tilts 5 degrees down and 15 degrees up allowing it to be positioned in several different places.

However, where this monitor really scores is in the high resolution colour tube. The resolution of a tube is measured by how close the phosphor dots are packed together: The smaller the dot pitch the more vertical resolution you can see and the sharper the picture will appear. Of course you can always get more vertical resolution by going to a larger tube size but, as 14in monitors are about the standard, the phosphor dot pitch is a good measure of resolution.

What pitch corresponds to standard, medium and high resolution has always been a moot point with advertisers. Normally a pitch of 0.6mm is referred to as standard, 0.42mm as medium and 0.32mm as high. Strange, isn't it, how there are no low resolution monitors!

Well the 8060S monitor has a staggering 0.28mm dot pitch – although I do see from the catalogue that there is a 8060H with a pitch of 0.32mm. The 0.28mm dot pitch produces a very clean crisp picture of the highest standards. I compared this with my NEC multi-sync monitor and the EIZO definitely produces a superior picture. Not only is it crisper, but the colours seem better – purer and richer – and there was no hint of any colour casts.

One of the problems with any multi-sync monitor is that as you change the line standards the size of the picture changes. So I was pleased to see that this one has a comprehensive set of controls to adjust the picture size at the front with horizontal and vertical position controls at the rear.

The vertical size control is continuous and the horizontal one works in a series of steps. I was able to find an optimum position for the two different line standards produced by the Archimedes so that I did not need to keep fiddling with the monitor as I changed modes There is still a size change when switching modes, but it is one I can live with.

In short, the EIZO 8060S is one of the best multi-sync monitors I have come across: The display is crisp, the colours pure and the housing attractive and practical. Those of you looking for Archimedes, BBC Micro and even IBM PC compatibility will be especially well suited.

EIZO FLEXSCAN

Basic brilliance

It's easy to produce superb graphics on the Archimedes – Stuart Tyrrell shows you how

THE power of the Achimedes is such that even the simplest Basic program can produce stunning graphical displays. And the routine given here is a classic example of that, presenting a three dimensional landscape with eight shaded spheres bouncing around it – complete with shadows. So type it in, ensure it is correct using Get it Right! and save it.

When you run it the first message you get will probably explain that not enough screen memory is available, so Archimedes 310 owners should type:

```
*CONFIGURE SCREENSIZE 60
```

If you have a 410 or 440 replace the 60 with 16. Now execute a hard Break – Control+Break – then reload the program and RUN it. It relies on the ability of the Archimedes to hold more than one screen in memory at once, in this case 12 Mode 9 screens. Two *FX calls – 112 and 113 – allow us to control which of these screens is addressed by the VDU driver, the screen being worked on, and which is addressed by the display hardware, the one being shown.

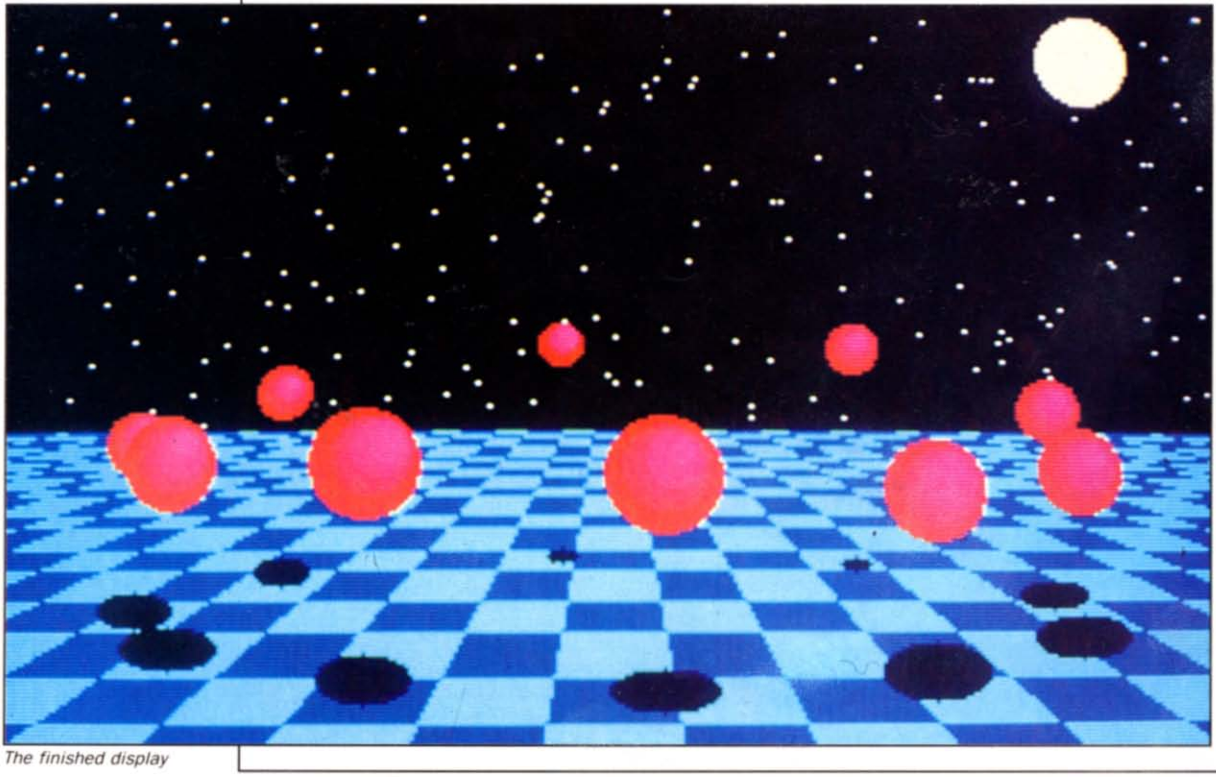
The spheres are drawn on screens 1 to 12 in slightly different positions, then each screen is displayed in quick succession giving the impression that the spheres are moving in three dimensions. The variable *NumOfScreens* is the number of screens used by the program, currently 12. It may be possible to run the program on an Archimedes 305 if this variable is set to a lower number but the display will be less effective. Owners of 440s can increase the number to provide even smoother motion.

In case you're wondering about the Wimp initialisation and immediate close down – it just defines characters 136 and 137 as arrow keys.

Lastly, don't forget to reset the value of SCREENSIZE when you have finished with:

```
*CONFIGURE SCREENSIZE 0
```

as some applications may not run in the little memory you have left.



The finished display

```
   10 REM > Bouncers
   20 REM By S.Tyrrell
   30 REM (c) The Micro User
   40 ON ERROR PROCerror:END
   50 NumOfScreens=12:size=40960
   60 MODE9:PROCchkscr:*FX4,1
   70 SYS "Wimp_Initialise"
   80 SYS "Wimp_CloseDown":*POINTER 0
   90 PROCwrite(NumOfScreens)
  100 PROCdisplay(NumOfScreens)
  110 CLS:PROCcols:PROCinstruc
  120 ORIGIN 640,512:dir=1:spd=4
  130 PROCsetstars
  140 FOR screen=1 TO NumOfScreens
  150   PROCwrite(screen):OFF
  160   PROCground:PROCdstars
  170   PROCmoon:PROCblobs:PROCc
  180   NEXT
  190 PROCch:PROCquit:END
  200 DEFPROCerror:ON ERROR OFF
  210 PROCquit:REPORT:PRINT" at ";ERL
  220 ENDPROC
  230 DEFPROCquit:*FX4
  240 MODE0:ON:ENDPROC
  250 DEFPROCwrite(screen)
  260 SYS "OS_Byte",112,screen:ENDPROC
  270 DEFPROCdisplay(screen)
  280 SYS "OS_Byte",113,screen:ENDPROC
  290 DEFPROCground:GCOL128:CLG:GCOL4
  300 FOR X=-10000 TO 10000 STEP 400
  310   MOVE 0,100:MOVEX-100,-512
  320   PLOT 85,X+100,-512:NEXT:GCOL7
  330 RECTANGLE FILL -640,0,1280,512
  340 Y=-8:YM=1.2:F=0:GCOL 3,4
  350 REPEAT:F=NOTF
  360   IF F RECTANGLE FILL -640,Y,1280,
Y*YM-Y
  370   Y=Y*YM:UNTILY<-600:GCOL 7
  380 RECTANGLE FILL -640,0,1280,512
  390 ENDPROC
  400 DEFPROCsetstars:stars=200
  410 DIM SX(stars),SY(stars)
  420 FOR T%=0 TO stars
  430   SX(T%)=RND(1280)-640
  440   SY(T%)=RND(512)
  450   NEXT:ENDPROC
  460 DEFPROCdstars:GCOL 5
  470 FOR T%=0 TO stars
  480   PLOT 69,SX(T%),SY(T%)
  490   NEXT:ENDPROC
  500 DEFPROCblobs:GCOL 0,7
  510 Q=screen/NumOfScreens*PI/5
  520 FOR X=Q TO PI*2+Q STEP PI/5
  530 LL=(SIN(X)-2)*20:CX=COS(X)*500
  540 CY=SIN(X)*70:PROCcircle
  550 GCOL 0,7:ELLIPSE FILL CX,CY-200,LL
+SIN(X*8)*8,(LL+SIN(X*8)*8)/2
  560 NEXT:ENDPROC
  570 DEFPROCch
  580 screen=1:end=FALSE:REPEAT
  590 FOR T%=1 TO spd:WAIT:NEXT
  600 PROCdisplay(screen)
  610 OFF:PROCkeys:screen+=dir
  620 IF screen<1 screen=NumOfScreens
  630 IF screen>NumOfScreens screen=1
  640 UNTIL end:ENDPROC
  650 DEFPROCmoon:GCOL 0,3
  660 CIRCLE FILL 500,400,50:ENDPROC
  670 DEFPROCc
  680 VDU 5:MOVE -416,-480:GCOL 0,8
  690 PRINT"BOUNCERS (c) The Micro User"
  700 VDU 4:ENDPROC
  710 DEFPROCcircle
  720 CL=8:CYB=CY+SIN(X*8)*30
  730 FOR P=LL TO 1+LL/8 STEP -LL/8
  740   GCOL CL:CL+=1
  750   CIRCLE FILL CX+P/2-LL/2,CYB+P/2-
LL/2,P
  760   NEXT:ENDPROC
  770 DEFPROCcols:COLOUR0,6:COLOUR7,0
  780 COLOUR5,7:COLOUR3,255,255,160
  790 FOR X=0 TO 7:COLOURX+8,255,0,X*24
  800   NEXT:ENDPROC
  810 DEFPROCkeys:CASE INKEY$0 OF
  820   WHEN CHR$136 : IF spd<10 spd+=1
  830   WHEN CHR$137 : IF spd>1 spd-=1
  840   WHEN "R","r" : dir=-dir
  850   WHEN "P","p" : REPEAT UNTIL GET
  860   WHEN "Q","q" : end=TRUE
  870  OTHERWISE
  880  ENDCASE:*FX21
  890 ENDPROC
  900 DEFPROCinstruc:X%=16
  910 PROCt(-1,3,8,"BOUNCERS")
  920 PROCt(-1,5,4,"(c) The Micro User")
  930 PROCt(-1,7,0,"Written by Stuart Ty
rrell")
  940 PROCt(X%-6,10,1,"Press Q: Quit")
  950 PROCt(X%,12,2,"R: Reverse")
  960 PROCt(X%,14,3,CHR$137+": Faster")
  970 PROCt(X%,16,4,CHR$136+": Slower")
  980 PROCt(X%,18,5,"P: Pause")
  990 PROCt(-1,25,6,"Wait a moment...")
 1000 ENDPROC
 1010 DEFPROCt(X%,Y%,C%,t$):COLOURC%
 1020 IF X%<0 THEN
 1030      SYS "OS_ReadModeVariable",MODE
,1 TO ,,X%
 1040      X%=(X%-LENt$)DIV2
 1050    ENDIF
 1060 PRINTTAB(X%,Y%)t$:ENDPROC
 1070 DEFPROCchkscr:LOCAL D%,E%:ok=TRUE
 1080 DIM D% 10,E% 10:!D%=150:D%!4=-1
 1090 SYS "OS_ReadVduVariables",D%,E%
 1100 IF !E%<NumOfScreens*size PROCerr
 1110 ENDPROC
 1120 DEFPROCerr:PROCquit
 1130 FOR M%=1 TO 4:PRINT':READ m$
 1140 SYS "OS_PrettyPrint",m$:NEXT
 1150 PRINT':SYS "OS_PrettyPrint","On a
310 type:"+CHR$13+CHR$13+CHR$9+"*CONFIGU
RE SCREENSIZE "+STR$(NumOfScreens*5)
 1160 PRINT':SYS "OS_PrettyPrint","On a
410/440 type:"+CHR$13+CHR$13+CHR$9+"*CON
FIGURE SCREENSIZE "+STR$(INT(NumOfScreen
s*1.25)+1)
 1170 ok=FALSE:PRINT':END
 1180 DATA There is insufficient memory
to run this program at present please re
-configure as given below
 1190 DATA If not already done -- save t
he program before re-configuring otherwi
se it is likely to be lost.
 1200 DATA After issuing the configure c
ommand press Shift+Break then reload and
 run the program.
 1210 DATA If there is insufficient memo
ry to reserve the above SCREENSIZE you w
ill have to reduce the variable 'NumOfSc
reens' in line 50
```

Animated display controls

Key	Effect
P	Pause – any other key to start rotation again
Q	Quit program
R	Reverse direction of rotation
Right	Speed up rotation
Left	Slow rotation

Get it right!

```
  10 =    0 0
  20 =    0 0
  30 =    0 0
  40 = 917E E
  50 = 3060 F
  60 = 5FF5 1
  70 = D648 A
  80 = C089 C
  90 = EE29 C
 100 =  CB8 B
 110 = A599 C
 120 = 181F F
 130 = D4B3 B
 140 =  FC1 C
 150 = EBC5 E
 160 = 7F70 1
 170 = AD6B 9
 180 = 2C83 6
 190 = A6A2 6
 200 = 7C02 A
 210 = 7545 F
 220 = ED0F F
 230 = 7E35 B
 240 = BC57 8
 250 = 4A04 5
 260 = 6293 4
 270 = 6A68 0
 280 =  DD6 B
 290 = E844 6
 300 = C8A6 D
 310 = 87F0 9
 320 = 5F63 2
 330 = A601 4
 340 = 8BA1 9
 350 = 261D C
 360 = 1451 9
 370 = 4C97 9
 380 = A601 8
 390 = ED0F B
 400 = 9041 0
 410 = 4C47 4
 420 = 8C2A B
 430 = 1CA5 C
 440 = F8C7 B
 450 = E531 C
 460 = 18DF 2
 470 = 8C2A 0
 480 = D338 4
 490 = E531 D
 500 = EE81 1
 510 = 25AB A
 520 = BED5 7
 530 =  33B 6
 540 = E997 6
 550 = EA6C E
 560 = E531 6
 570 = AF60 6
 580 = 285E 8
 590 = D66B B
 600 = 281F E
 610 = 43C4 5
 620 = E8BF 0
 630 = B0F7 8
 640 = 7163 7
 650 = 59D1 0
 660 = B2E4 2
 670 =  EA3 C
 680 = 1B34 5
 690 = 1C21 D
 700 = 778F 5
 710 = 10C0 4
 720 = AC91 8
 730 =  FD7 2
 740 = 9E54 7
 750 =  9EE 3
 760 = E531 6
 770 = 9AEA 7
 780 = D782 0
 790 = A390 6
 800 = E531 2
 810 = CFC0 8
 820 = CB63 F
 830 = 5943 1
 840 = D9FB 0
 850 = 8288 A
 860 = 3CDA 9
 870 = 8F78 A
 880 = 2141 D
 890 = ED0F 3
 900 = F443 7
 910 = F032 B
 920 =  F0F A
 930 = 56DD 3
 940 = 208A 3
 950 = C199 4
 960 = EB46 7
 970 = 5523 4
 980 = 146E 7
 990 = 317D 2
1000 = ED0F F
1010 = 881A A
1020 = 7F7E 5
1030 = B6E4 C
1040 = F456 A
1050 =  8E1 E
1060 = 7292 5
1070 = 98D8 9
1080 = 7B3F B
1090 =  5F4 3
1100 =  1FC 5
1110 = ED0F 5
1120 = 58FF 6
1130 =  7B2 E
1140 = 1F17 0
1150 = 8796 F
1160 = 79E2 0
1170 = 10B6 A
1180 = 48B1 6
1190 = 134B C
1200 = 1943 D
1210 = BDB3 2
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Compact
Archimedes

U·P·D·A·T·E

Scotland opts for Archimedes

MORE than 100 Archimedes 310 micros have been installed in schools in Scotland. The Central Regional Council has put the machines in half its schools as part of a three year technology development programme.

Previously, all the Council's schools were equipped with computer laboratories containing BBC Micros and Masters. By replacing them with Archimedes, schools in the region expect to accommodate increasing demand for micro-based learning across the curriculum.

One of the main reasons the council chose Archimedes was the introduction of a new examination – Higher Grade in Computing – which requires a 32 bit machine with the ability to run a wide range of commercial software.

The Archimedes also enables IT staff to maintain present work being undertaken on BBC Micros and Masters. "Staff development for training teachers to use the Archimedes systems to their full potential has resulted in a positive and enthusiastic response", said George Connell, education adviser at the Central Regional Council.

...and so does Singapore

THE United World College in Singapore has bought 68 Archimedes 305 machines to use in CDT, humanities, languages and computer training.

More than 1,200 students between the ages of 11 and 18 attend the college. They come from all over the world, many of them the children of expatriate British families living in the Far East and Australia.

All first and second year students have begun undergoing a four-week course covering applications such as word processing, spreadsheets and databases.

Two Econet networks, with a total length of 1.5km, are being installed at the college which will also have two dedicated computer rooms each equipped with 25 machines. Every classroom and laboratory will eventually have a networked Archimedes system.

College administration and planning functions will be computerised, with an Archimedes in every office. "We feel that the Archimedes systems offer the best route to the future for education as well as being able to run PC and BBC Micro software under emulators," said Graham Smith, head of computing at the college. "Our students follow GCSE and other international syllabuses and there is a good supply of BBC Micro and Archimedes packages to support these courses".

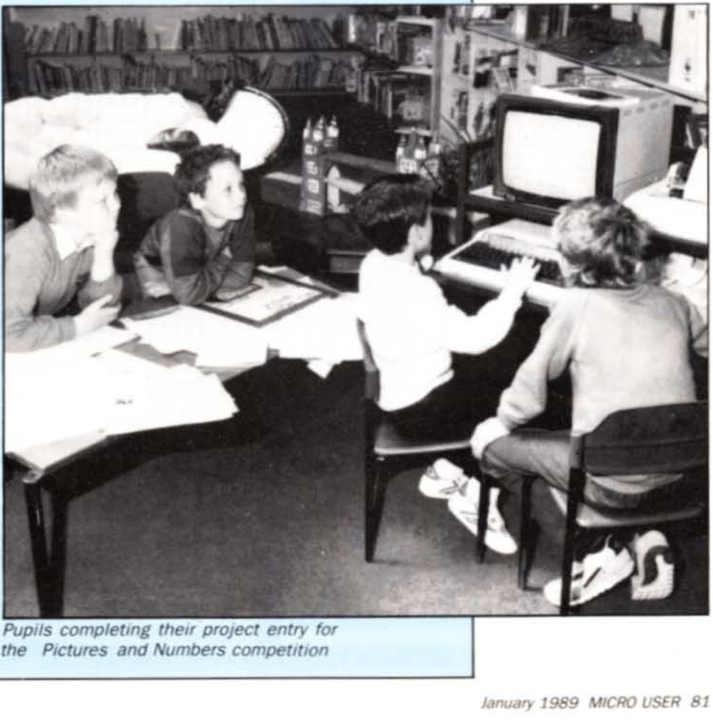
Learning via the environment

SHOCKED by a survey follow-up to its Pictures from Numbers project for schools, printer manufacturer Citizen Europe has announced another challenge in conjunction with the World Wide Fund for Nature. Called Datachase, it aims to encourage youngsters to develop an interest in data handling through identifying, investigating and learning about environmental issues.

It will also help pupils develop presentation and creative skills through the use of computers, and demonstrate how problems can be solved by teamwork.

Robin Marriott, Citizen Europe marketing manager, said: "When we launched the Pictures from Numbers project we received over 1,200 applications. We decided to go back to some of these schools to try and establish the extent of their computer facilities to gain an insight into existing

Turn to Page 82 ▶



Pupils completing their project entry for the Pictures and Numbers competition

◀ From Page 81

attitudes towards using computer equipment.

"The results astounded us – there is still an overall shortage of computer equipment in schools and a vital gap in time put aside for training of teachers and children alike. Many teachers are not comfortable with computer technology and the difficulty of access to equipment compounds the situation.

"This inevitably means that micros are not widely exploited in schools for problem solving and creative presentation as they are in business and industry".

The Datachase project will run until May 26. Details and packs can be obtained from WWF United Kingdom, Panda House, Weyside Park, Catteshall Lane, Godalming, Surrey GU7 1XR.

Latest edition

THE final update of Micro Librarian Professional for the Archimedes should be ready this month. Twelve months in development, the package has grown from the Master 128 version launched last year by Micro Librarian Systems (061-449 9357).

"Feedback from users has helped us through two or three updates and we are nearly ready to issue the final Archimedes version", said a spokesman. The software will cost £300 and can be customised to suit individual requirements for a further £200.

An Archimedes version of Secondary Micro Librarian is now available, price £90.

Taking a Risc with networks

ECONET networking systems can be dramatically speeded up by adding an Archimedes and the new ARCshare software package developed by the European Communications Group (01-546 0827) – sister company of Kelator, one of Acorn's distributors.

Acorn says Risc technology plus ARCshare enables data transfer that is an average of 20 times faster than on networks using only BBC Micros or Masters.

The software, which costs £139 for a 10-user licence and £30 for additional 10-user packs, is designed for use with Basic programs. It is aimed particularly at late secondary and tertiary education where Econet speed and performance is important and teaching time at a premium.

European Communications Group director John Simnett said: "Econet users who require faster performance from their systems will find that upgrading with an Archimedes and ARCshare is an excellent and cost-effective solution to their problems".

The truth about TELEX

How much does it cost to go on Telex?

You could go the conventional way and buy a dedicated Telex machine. The cheapest will cost you £1,604 (the Whisper), the dearest £2,892 (the Cheetah). You will also need a separate telephone line, costing £101 to install, plus £404 a year rental. That's a total outlay over the first year of a minimum of £2,109. (All prices include VAT.)

Or you could do what more and more BBC Micro users are doing – use your BBC Micro to double as a Telex machine. And just use your ordinary telephone!

How do I turn my BBC Micro into a Telex machine?

All you need is a modem and appropriate communications software (see the advertisements in this issue), a telephone, and a subscription to *MicroLink*.

Telex is just one of a growing number of services available to micro users on *MicroLink*. You can also read the news as it happens, go teleshopping, create your own closed user group, send telemessages and electronic mail right round the world, download free programs directly into your micro . . . and much more.

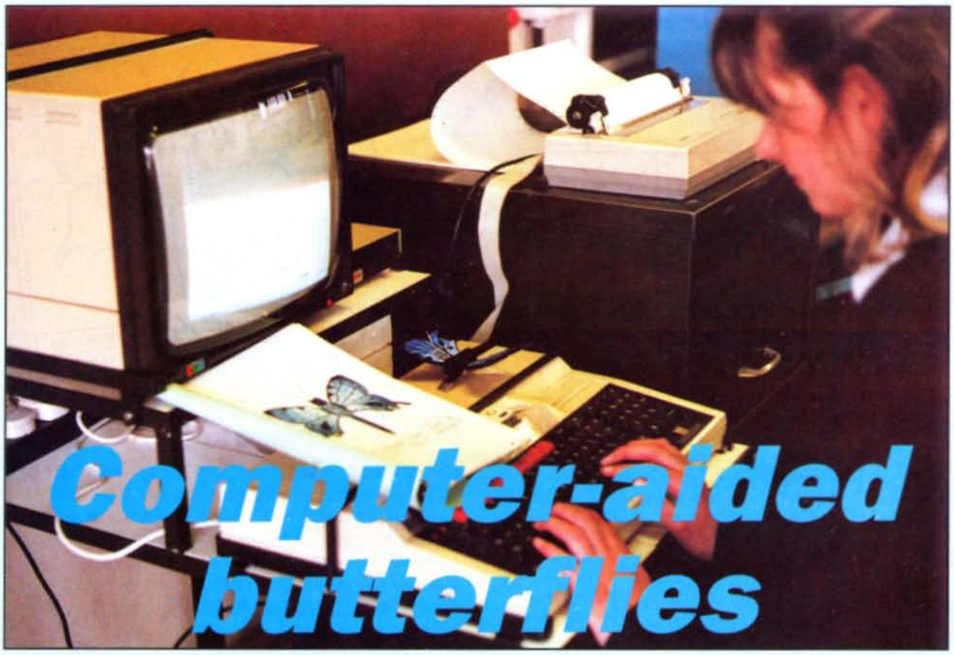
But why use Telex?

Because it's a standard means of instant communication between businesses. Today there are 150,000 Telex machines in use in Britain – and more than 2 million worldwide. It's used to dramatically speed up business communications – it's just as quick as using the phone but far more efficient, because you have a hard copy of every "conversation" for your records.

But there's a big bonus you get when you use *MicroLink* for Telex that the conventional way doesn't offer.

With *MicroLink* you don't HAVE to be in your office to send or receive Telex messages. You can just as easily use your computer at home (or even a portable). So now you can check whether there are any Telex messages waiting for you – anywhere, anytime. How's that for your business efficiency?

**How to join:
Phone 0625 878888**



Computer-aided butterflies

Peter Harrison presents his program for harassed teachers

SPLITTING one micro among 20 pupils is a problem in any school. But the solution is simple – you just need the right software. So here's a program – Butterflies – to help you overcome the difficulties of inadequate funding.

The program is particularly useful in lower school or with less able pupils and introduces the concept of CAD – computer-aided design. It allows a single machine to be utilised by a whole class with the opportunity to introduce design and construction of butterflies while providing the experience of working with different materials.

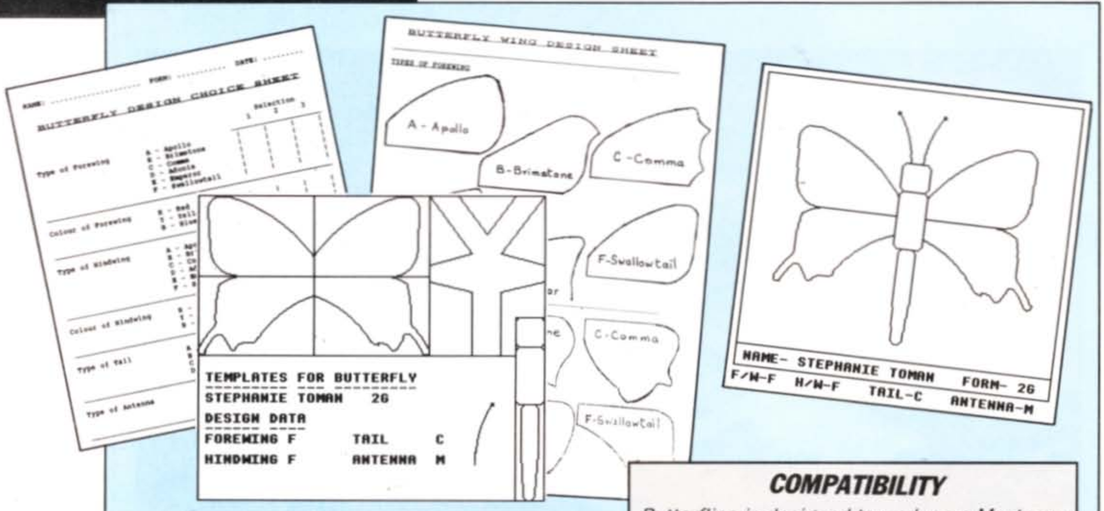
You could use the following sequence when introducing the program:

- A short talk on butterflies and their life cycle.
- A discussion of their shapes and proportions together with reasons for their many colours.
- An explanation of how to use the program.
- Distribution of the handouts so each pupil can make wing shape and colour selections.

The program itself is, unfortunately, too long to publish as a type-in listing so we've included it on the monthly tape and disc. It's simple to use: Just enter your name, make protected single key selections and, finally, the butterfly will be drawn in its full glory. There are various on-screen options for printing templates or the full picture. It's the templates that are the key to the whole project because using these you can construct a

Turn to Page 84 ▶

Display using butterflies made by the children


BUTTERFLY DESIGN CHOICE SHEET
NAME:
FORM:
DATE:
Selection
1
2
3
Type of Forewing
A - Apollo
B - Brimstone
C - Comma
D - Adonis
E - Emperor
F - Swallowtail
Colour of Forewing
Type of Hindwing
Colour of Hindwing
Type of Tail
Type of Antenna
BUTTERFLY WING DESIGN SHEET
TYPES OF FOREWING
A - Apollo
B - Brimstone
C - Comma
F-Swallowtail
C-Comma
F-Swallowtail

```
TEMPLATES FOR BUTTERFLY
--------- --- ---------
STEPHANIE TOMAN   26
DESIGN DATA
------ ----
FOREWING F       TAIL     C
HINDWING F       ANTENNA  M
```

```
NAME- STEPHANIE TOMAN      FORM- 26
F/W-F  H/W-F    TAIL-C   ANTENNA-M
```

Sample worksheets and output from the program

Due to its length the excellent Butterflies program cannot be printed in *The Micro User* but it is on the monthly tape and disc – see the offer on Page 142.

◀ *From Page 83*

butterfly from a variety of materials and have them painted or coloured in. The butterflies in the picture were made from plywood painted in acrylics.

So there it is – now you can enjoy having Butterflies.

COMPATIBILITY

Butterflies is designed to work on a Master or Compact, but it will also run on a B+ with a GXR – graphics expansion – rom or a B with both Shadow ram and GXR. It will also run on the Archimedes – where some simple changes could increase the colour choice and allow screen saving for later colour printing or use in an art package.

The printing routine has been left empty and you can slot a dump routine suitable for your own printer at the end of the program.

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Written by Master expert David Atherton in conjunction with Paul Horrell and Bruce Smith, there's so much information crammed into this book that even expert programmers will find something new.

The Dabhand Guide costs only £12.95, but for £15.99 you can get both the book AND a 5.25in disc containing all the programs from it. Or for £16.95 you can have the 3.5in version.

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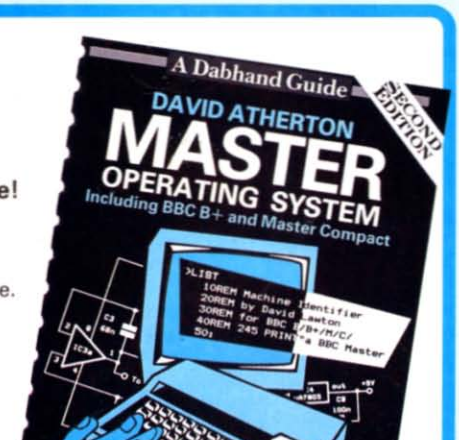
A Dabhand Guide
SECOND EDITION
DAVID ATHERTON
MASTER
OPERATING SYSTEM
Including BBC B+ and Master Compact
>LIST
10REM Machine Identifier
20REM by David Lawton
30REM for BBC B/B+/M/C/
40REM 245 PRINT"a BBC Master
50:
DABS PRESS

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Andrew Heaton enjoys an adventure in the Antipodean bush

BUSH RESCUE from 4Mation Educational Resources is a cross curricular adventure package which requires you to plan an adventure trip in an Australian National Park. Once you get there you become involved in helping to find and rescue an injured caver. Having done this you then help navigate the rescue helicopter to hospital. Finally, as with all good adventures you are asked to write about it.

It is a lengthy procedure, but each section can be completed at different times and stored. To work through the program you have to master many tasks. You are provided with an assortment of material including maps of Caves Bay National Park, a visitor guide to the park and the adjacent fun coast, train and bus timetables, checklists, incident report forms, flight logs and a guide to the Infotel booking system.

Before attempting the adventure you must first familiarise yourself with certain procedures – reading the background information, using Infotel, planning a search, making a log bridge, map reading, flying the helicopter and making a rescue flight.

You really must study all the information given: If you dive straight in the program can seem frustrating to the point of abandoning it entirely. This is a plus point, because you are not just using the BBC Micro for learning, but as a source of many different types of information.

Strategy is also important, and it is best to plan what you want rather than arrive at a course of action through trial and error. Mapping skills and compass knowledge are essential during the search. As this section is text-based a list of the words understood by the program are provided.

Learning navigation and flying the helicopter is great fun. You have to interpret the contours of the map into a three dimensional plan, as at no time must it be flown above 80m from the ground, and the subsequent route can be planned by using up to 10 legs. If during practice the copter is flown more than 4km a proficiency certificate in navigation will be issued if P is pressed and the printer linked.

To get to Caves Bay you must book your train and bus using the Infotel system. Careful study of the timetables is needed choosing the correct day and a time when there is a bus at the Tilford Station stop. To further test your brain, the train timetable is in the 24 hour clock while the bus has a 12 hour timetable.

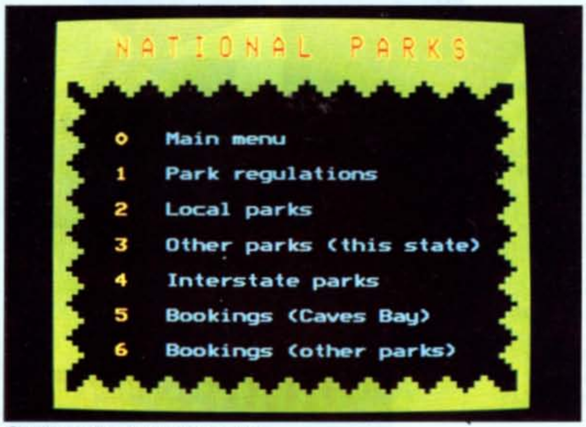
There are three levels of difficulty for the actual bush search. On the harder ones you have to do more and the time given passes more quickly. Whatever the level, the search has to be completed by 6pm otherwise you must abandon for the day and start again the next.

Success depends on you building a bridge to cross the river by arranging planks of the correct lengths between the two banks and the island. Next you take the glue from the hut – later used to repair the boat. You must find the right cave to locate the injured person and then return him to camp by using the helicopter and one of your

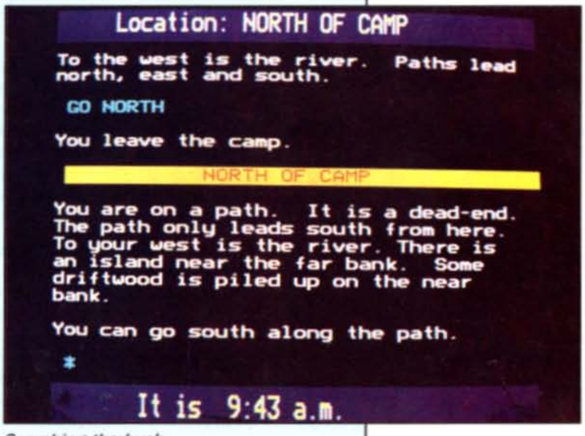
Turn to Page 88 ▶

Points for
- **Instant appeal**
- **Wide curricular application**

Against
- **Lacks good graphics**
- **Very lengthy**



Getting background information



```
Location: NORTH OF CAMP
To the west is the river.  Paths lead
north, east and south.

GO NORTH

You leave the camp.

NORTH OF CAMP

You are on a path.  It is a dead-end.
The path only leads south from here.
To your west is the river. There is
an island near the far bank.  Some
driftwood is piled up on the near
bank.

You can go south along the path.
 *
It is 9:43 a.m.
```

Searching the bush

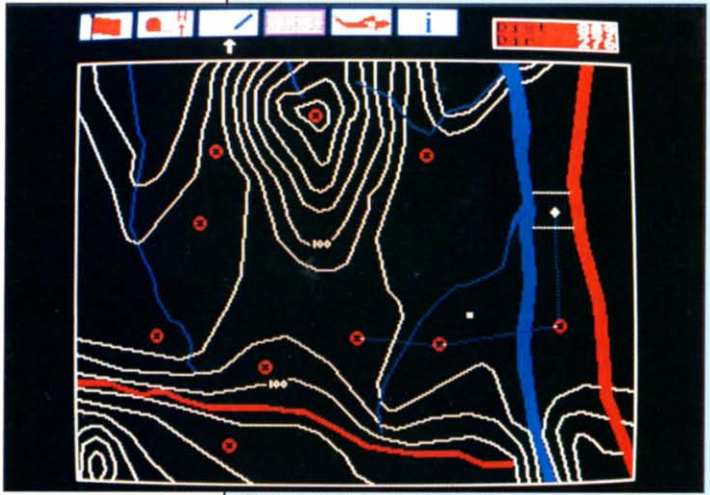
◀ From Page 87

Bottom line

A very good product for the more able student

previously practised flight plans.

If that sounds straightforward and simple, don't be fooled. The program has considerable depth. Making your bookings through the Infotel system to begin with is lengthy but great fun. Finding out whether you have booked the correct train or bus, via the mailbox, and reading other information in there enabling you to continue is a novel idea and relevant to the explosion in electronic communication.



Planning the helicopter route

The bridge building is a rewarding graphic interlude. Designed to be a confidence builder, the movement of the man and his logs to eventually build the bridge is satisfying. Once you start looking for specific items and entering the mazes on the screen the motivation aspect lapses. You must now refer to the maps and plans and memorise or record where the caver has been and the direction he took, taking care to note the caves left to be searched.

When it comes to writing up the adventure, the printed result looks much better if all three screens are occupied. Of course, the write-up exercise could be done using other word processing packages.

The program is designed to be cross-curricular, and its use in a classroom would involve some planning to maximise its potential. Ideally Bush Adventure would form the hub of a term's work on mathematics, language and creative work – all of which could easily be linked. The manual gives eight pages of suggestions for classroom use.

There is instant appeal for anyone who prefers something other than fantasy. It isn't easy to use and requires a fairly bright determined group to work their way through it. On screen it is rather wordy – more graphics with clues would be a great improvement.

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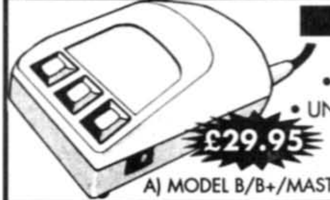

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One way is to open the outside box and make a note on a piece of paper that the cheque it contains is worth twice what the cheque inside the next box is worth. Then you open the next box, make a note of that and so on. You'd carry on opening boxes and making a note of the cheques until you get to the last box. This contains nothing but a cheque, but this final cheque is different from the others. It actually has an amount written on it. Using this information, the problem begins to unravel as you can work backwards figuring out the value of each cheque.

If the final cheque said *"Pay Five Pounds"* then not only would you know that you had a fiver in the bank but also the previous cheque must be worth

The recursive trap

THEY say that if you build a better mousetrap the world will come rushing to your door. Well, it might, but if you manage it don't think you'll get congratulations from those who've built earlier versions. Grudging respect is about the best you can expect. What's brought about this ungenerous mood is nothing to do with mousetraps, but everything with programming. And one program in particular.

For reasons best known to myself, I wanted a little conversion routine to take a normal decimal integer, say 23, and convert it into its binary representation, 10111. I wasn't going to use the binary number for anything else, so all I really wanted was a binary string that I could display onscreen rather than a number to use in calculations.

If I was going to do any maths with the numbers, I may as well do it using the decimal numbers both I and Basic understand. Afterwards my routine could convert the result to the binary needed for the display. The method I came up with was to repeatedly divide the decimal number by 2, collecting successive remainders to make up the final binary number. Figure I shows how it's done.

Program I shows how I've used the method, *PROCprocessNumber* being the routine that does the work. It may be a bit longwinded and fairly un-mugtrapped but I've gone for clarity rather

It's a lot easier to use than to explain

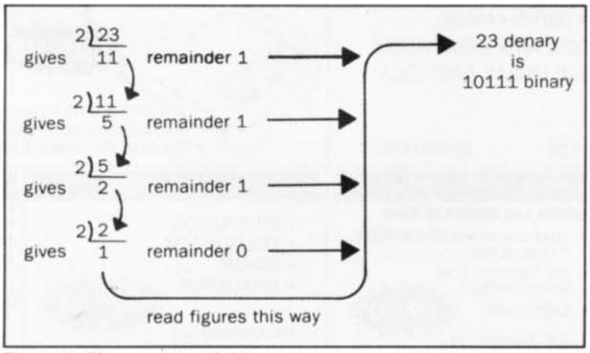

Figure I: Binary – the divide and conquer method

```
 10 REM Program I
 20 PROCgetNumber
 30 PROCprocessNumber
 40 PROCprintBinary
 50 END
 60 DEF PROCgetNumber
 70 INPUT number
 80 IF number<1 THEN PROCg
etNumber
 90 ENDPROC
100 DEF PROCprocessNumber
110 finished=FALSE:binaryS
tring$=""
120 REPEAT
130 IF number<2 THEN binar
yString$=binaryString$+STR
$(number):finished=TRUE
ELSE binaryString$=binaryS
tring$+STR$(number MOD 2):
number=number DIV 2
140 UNTIL finished
150 ENDPROC
160 DEF PROCprintBinary
170 PRINT binaryString$
180 ENDPROC
```

Program I

```
get a decimal number
print out the binary equivalent of number

   get a decimal number
         take number from keyboard
         if number is less than one then
              get a decimal number

print out the binary equivalent of number
   if the number is greater than one then
         print out the binary equivalent of number divided by two
   print out the remainder when number is divided by two
```

Figure II: Pseudocode for Program I

B B+ M

£10, the one before that £20 and so on until you run out of cheques. You can then add up all the amounts to see just how rich you are.

Notice that you can't figure out the total until every box has been opened – only when there are no more boxes to be opened and you've got the uncomplicated cheque can you be sure that can figure out how much you've got coming to you.

This method of repeating the same actions over and over until a finishing condition is met and then going backwards using the results from each successive step is called recursion. And it's a lot easier to use than to explain!

Bob Peal takes a look at himself looking at himself looking at...

than brevity. The pseudocode in Figure II shows the design lurking behind the program. So there I was with a working program, my metaphorical mousetrap.

And all was well until I let my nephew Nigel see the program. I think that what got him going was when I mentioned that I'd used recursion in *PROCgetNumber*. If you hadn't noticed it, take a look at line 80, which repeatedly calls *PROCgetNumber* from inside itself if *number* is less than one.

Now Nigel knows recursion backwards – that's noisrucer – which was why I'd pointed it out. I wish I hadn't bothered because his only reaction was to wonder why I'd used recursion for such a trivial task and ignored it when it came to converting decimal to binary. He then went on to show exactly what he meant by converting my Program I to Program II. The peudocode of Figure III shows the scheme behind the listing.

Looking at the new version of *PROCprocessNumber*, I've got to admit – grudgingly – that it's a lot neater. Although it's well hidden, it still uses the same method as my program except now it's implemented using recursion.

Put briefly, recursion works by dividing a complex problem into successively simpler versions of the same problem until a very simple case, for which an answer is known, is found. Using this result, you then work backwards solving each of the earlier problems in turn from the simplest to the original, most complex, one. Figure IV shows how it works in this case.

But while this is another of our metaphorical mousetraps, is it a better one? I admit it uses recursion, and even a procedure with a parameter, but while this may bring programming Brownie points, is it better? Well, it's certainly shorter and more elegant, but really it just does the same job only rather more obscurely. So if that was all there was to it, I'd say that they were about the same. But having said that, I think Program III settles the issue in favour of Nigel's recursion.

Not content with just converting from decimal

Turn to Page 92 ▶

```
 10 REM Program II
 20 PROCgetNumber
 30 PROCprocessNumber(numb
er)
 40 PRINT
 50 END
 60 DEF PROCgetNumber
 70 INPUT number
 80 IF number<1 THEN PROCg
etNumber
 90 ENDPROC
100 DEF PROCprocessNumber(
number)
110 IF number>1 THEN PROCp
rocessNumber(number DIV 2)
120 PRINT; (number MOD 2);
130 ENDPROC
```

Program II

```
get a decimal number
process the number into a binary string
printout the result

   get a decimal number
      take number from keyboard
      if number is less than one then
         get a decimal number

process the number into a binary string
      set finish flag to false
      set binary string to empty
      repeat
         if the number is less than 2 then
            add the number to the end of the string
            set finished to true
         else
            divide by 2
            add the remainder to the end of the string
            set number to the dividend
      until finished
```

Figure III: Pseudocode for Program II

HANDLING RECURSION

One thing that seems to cause confusion is when a procedure calls itself recursively. In Program III's definition of *PROCprocessNumber*, line 110 contains a call to *PROCprocessorNumber*. Isn't this a bit like picking yourself up by your own shoelaces? Doesn't the program get lost?

The answer is no. Suppose you wanted to climb some stairs. While you wouldn't write it down, you'd probably do something like:

```
climb flight of steps if at top say 'I hate
heights'else climb flight of steps
```

You wouldn't get confused. You'd know that the second reference to "climb flight of steps" doesn't mean go back and climb the steps you've just come up but actually means go up the *next* flight of steps. You're doing the same actions, plodding upwards, but doing them on a different set of steps.

Similarly, when *PROCprocessNumber* calls itself it does the same actions but on another number. The actions laid down in the procedure definition are followed but with new data. And although the same instructions are followed, each call to *PROCprocessNumber* is treated as a separate piece of code with its own data. Just as you don't get confused by different flights of stairs, so BBC Basic can find its way through successive recursive calls of the same procedure.

The only rule is that the recursion has to end somewhere. There has to be a final, limiting condition which stops the recursion in its tracks and allows it all to unravel. Given that, BBC Basic handles recursion with no problems. You may still get confused by it, but the micro won't be.

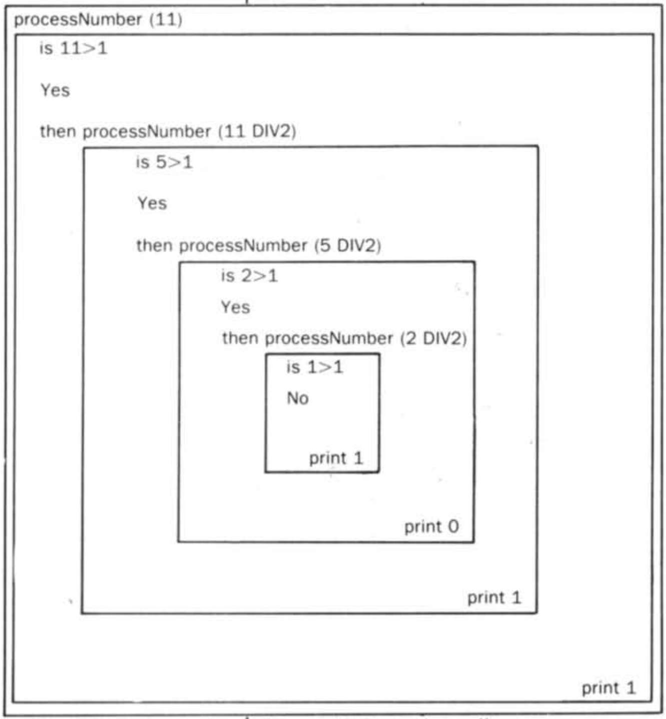
processNumber (11)
is 11>1
Yes
then processNumber (11 DIV2)
is 5>1
Yes
then processNumber (5 DIV2)
is 2>1
Yes
then processNumber (2 DIV2)
is 1>1
No
print 1
print 0
print 1
print 1

Figure IV: Recursive calls

◄ **From Page 91**

to binary, Program III will convert from decimal to any base – the pseudocode is practically the same as that for Program II, so I'll leave it to you to figure out. After using it a 42-year-old I know now gives her age as 22 but omits the base 20. I think it wins hands down.

But I'm not pleased about it: He may have built a better, more elegant mousetrap, but he'll get no thanks from me. None. I'm working on an even better version behind his back because there's a flaw in his program.

Try converting a decimal number to hexadecimal and you'll see what I mean. Where are the 8As and B9s beloved of machine code freaks? So there's a problem to solve. And what about converting any base back to decimal? No, it's a good mousetrap, yet it could be better. But that's where we came in....

```
 10 REM Program III
 20 PROCgetNumberBase
 30 PROCprocessNumber(numb
er,base)
 40 PRINT
 50 END
 60 DEF PROCgetNumberBase
 70 INPUT "Enter number fo
llowed by base " number,ba
se
 80 IF number<1 OR base<2
THEN PROCgetNumberBase
 90 ENDPROC
100 DEF PROCprocessNumber(
number,base)
110 IF number>(base-1) THE
N PROCprocessNumber(number
 DIV base, base)
120 PRINT; (number MOD bas
e);
130 ENDPROC
```

Program III

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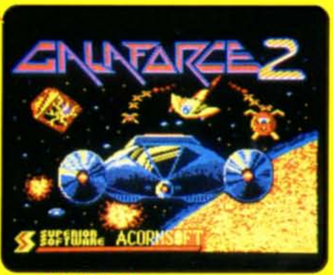

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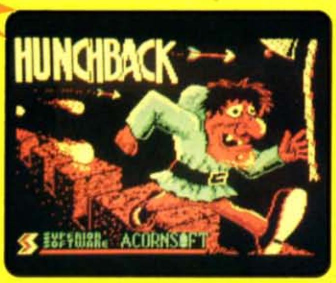

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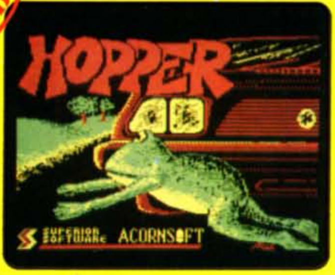

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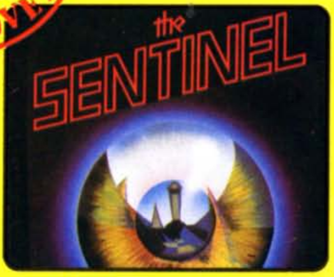

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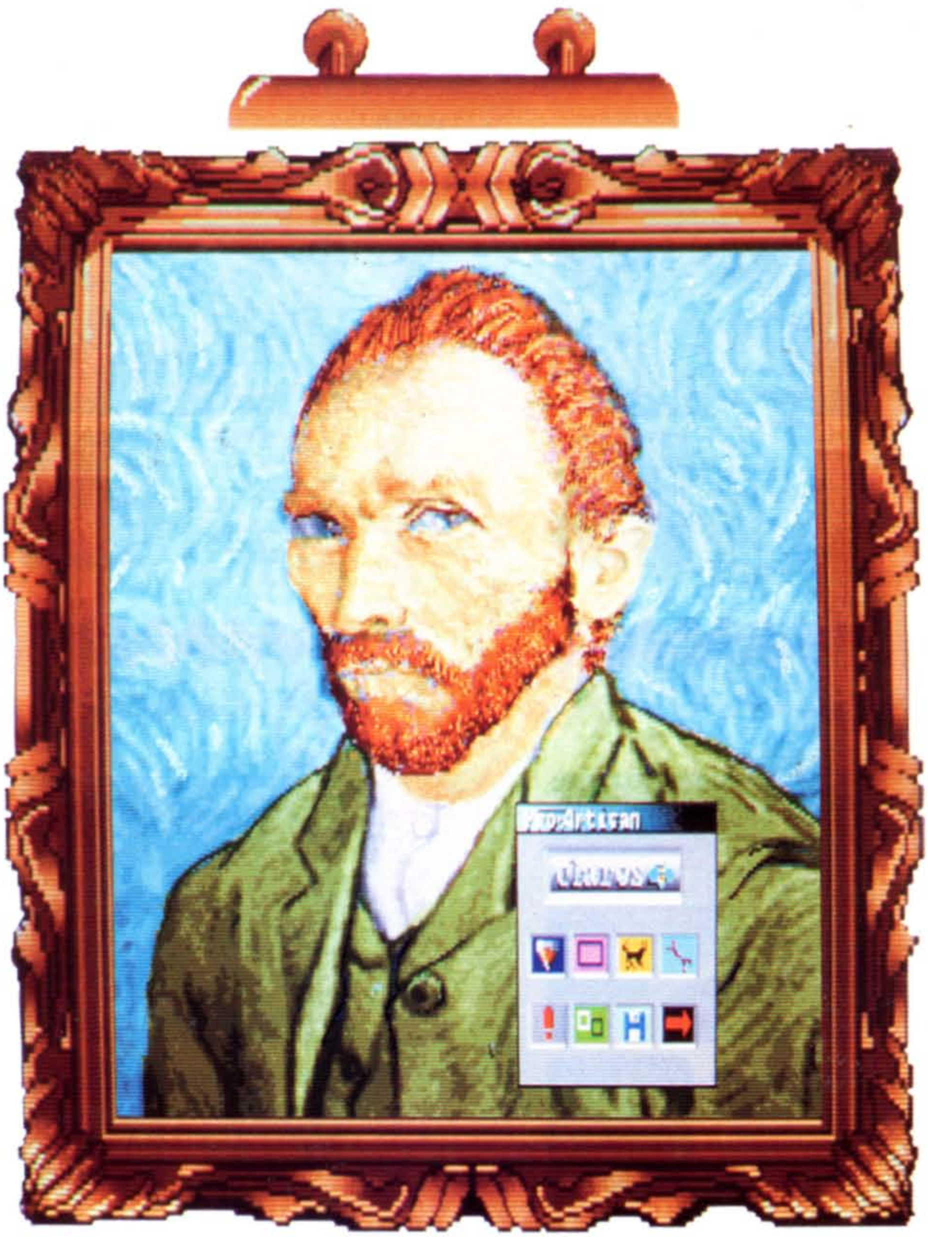

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Read all about it – easily

A printer driver for program listings from Delos D. Harriman

DEBUGGING programs is easier when you have a hard copy of the listing, but the disadvantage of paper is that you can't use search commands to find your way around it. Well here's a program to help you get round this and other difficulties. Another snag with printouts – from Epson-compatible printers at least – is that it's impossible to get all the characters printing correctly.

British Ascii has a £ but no # and American Ascii has a # but no £. Since BBC Basic uses both, this can be a big problem.

This program generates a machine code routine that acts as a kind of printer driver for Basic. Typing *EPSON installs it and solves both problems automatically – all characters are printed correctly and all procedure and function definitions and assembler labels are printed in bold type, making it far easier to find your way around a large program.

Not only that, if you are in the habit of using teletext colour codes in your listings all coloured text will also be printed in bold type.

There's one other useful feature: The printer is instructed to leave a margin of a couple of blank lines at the top and bottom of each sheet which neatly eliminates the problem of one line per sheet being printed over the perforations.

So type in the listing and ensure there are no typing errors using Get it Right! Next save it as EPS/SRC then RUN it and the machine code routine EPSON will be generated and saved. You can copy the file on to any of your work discs and keep the source code safe on a backup.

To get the full – improved – listing take the following steps:

- Wind the paper through the printer so that the top of the sheet lines up with the top of the print head and then type *EPSON to load the printer driver.
- If you haven't already done so, type Control+B to turn the printer on – the driver resets it so that it knows when to expect the perforations.
- Type LIST exactly the same way as you would normally.

When printing is finished press Break to stop the printer driver running – it's not strictly necessary unless you are going to be using user-defined characters, but it's the safest way. Also take care not to type *EPSON twice, otherwise a new copy is loaded over one which is already running – causing the micro to crash.

So now you don't need to spend hours trying to find the right procedure – it'll be staring you right in the face.

When the program is run, *setup* is called which intercepts the *insert character into buffer* – INSV – vector. Subsequently whenever any character is sent to the printer it will first be sent to the driver.

When the first character arrives the driver sends codes to reset the printer, tell it to skip four lines at the end of every sheet and select USA Ascii.

It does this because USA Ascii is the closest match to the BBC Micro's Ascii, differing only in that it has a closing single quote in place of the £ sign. The driver only reverts to UK mode when it needs to print a £.

If you need to set up the printer to a particular configuration beforehand, for example a non-standard length of paper sheet, line 630 – which resets the printer – may be omitted. If this is done you must ensure that the printer knows where top-of-form is – align the paper so that the print head is at the top of the sheet and then turn the printer off and on to reset it.

The driver program is exactly one page long and lives in page &C, which will overwrite the user defined characters. This should not be a problem, since the driver will only normally be used while programs are being listed, not while they are being run. It also uses zero page locations &8C to &8F.

When a character is printed, the program is

Turn to Page 96 ▶

COMPATIBILITY

The printer driver program was written on a BBC B using an Epson MX-80. It has subsequently been used extensively with an FX-80 and an FX-800. It should work on any Epson printer and on any compatible which supports these following control codes:

Code	Action
Esc,"@"	reset printer
Esc,"N",n	set *skip over perforation*
Esc,"R",n	select international character set
Esc,"E"	start emphasised mode
Esc,"F"	stop emphasised mode
Esc,"G"	start double-strike mode
Esc,"H"	stop double-strike mode

It should work on all 6502-based BBC Micros – not Archimedes – providing the two following points are noted:

- On a dual processor system it must run in the host – not language – processor.
- On a Master using Econet it will overwrite the Econet workspace, so must be assembled at a different location in memory.

◄ From Page 95

entered at *my–insert* with the character in *A* and the buffer number in *X*. The first thing the program does is check that the buffer number is 3 – the printer buffer – and continue with normal operation if it is not.

The program then checks to see if the character is a quotation mark so that at any time it will know whether the current character is part of the program or whether it is something in quotes – like the text of a print statement.

It also keeps a record of the last three characters printed – to check for the keyword DEF – stored in buffer+1, buffer+2 and buffer+3. The current character is stored in buffer+0.

It then checks to see if the line is permanently emphasised (line 730), or if the character is inside quotation marks (line 790), in which case it skips the checks for DEFs and labels, because they are irrelevant. If the last three characters were "DEF" the current character is checked to see if it is an F, P or space in which case this is probably a procedure or function definition, so it's emphasised.

If it's not, the last character is checked to see if it was a dot, and if not, the program branches to *not–dot*. Otherwise, the program checks to see if we can reasonably assume that this is an assembler label: The dot is preceded by an assembler bracket, a line number, a space or – in the case of a text file without line numbers – a new line or other control character. The label must also start with a valid character for a BBC Basic variable.

If it's not a label the program checks for a colon, a space, an equals sign, a new line or other control character, and if it finds one stops emphasis. These are all characters which could indicate the end of a label or of a procedure/function name.

Now if a Return is found the quotes flag is reset to *not in quotes*, the *permanent emphasis* flag is reset and emphasis is stopped. The final two checks are for a character code 128 or greater, in which case the line is permanently emphasised, and for a £ sign in which case the UK character set is momentarily switched in.

If the character survives all of this it is sent on its way to the printer buffer.

The reason for the PHP:CLI:NOP:NOP:PLP at line 1930 is that the program may often need to send more than just the one character it was given to the printer – for example the emphasise and de-emphasise codes. If the printer buffer is full the program will have to wait for a while until there is room. However, if interrupts were disabled when the INSV routine was called the buffer will never empty, so the program will wait for ever. The solution is to store the old processor status, enable interrupts, wait for a couple of NOPs to give the processor chance to do its interrupts and send a character to the printer, and then restore the processor status to whatever it was before.

```
  10 REM EPSON printer driver
  20 REM by Delos D. Harriman
  30 REM (c) The Micro User
  40 Z%=&C00:buffer=&8C:PROCass
  50 s$=" "+STR$~Z%
  60 e$=" "+STR$~P%
  70 x$=" "+STR$~setup
  80 DIM os%256
  90 PROCos("SAVE EPSON"+s$+e$+x$)
 100 END
 110 DEFPROCass
 120 FORT=0TO2STEP2:P%=Z%:[OPTT
 130 .my_insert:CPX#3:BEQ prn
 140 .oldinsert:JMP&FFFF
 150 .prn:PHA
 160  CMP#ASC""":BNE not_quote
 170 .quote:LDA#3:EOR#128:STA quote+1
 180 .not_quote:LDY#2
 190 .next_shift
 200  LDA buffer+0,Y:STA buffer+1,Y
 210  DEY:BPL next_shift
 220 .reset_prn:LDA#ASC"@"
 230  BMI already_reset_prn
 240  STYreset_prn+1:JSR esc
 250  LDA#ASC"N":JSR esc
 260  LDA#4:JSR insert
 270  JSR character_set_0
 280 .already_reset_prn
 290  PLA:STA buffer
 300 .mode:LDY#0:BMI skip_checks
 310  LDY quote+1:BMI skip_checks
 320 .next_def
 330  LDA buffer,Y:CMP def-1,Y
 340  BNE not_def:DEY:BNE next_def
 350  LDA buffer
 360  CMP#ASC"F":BEQ emph
 370  CMP#ASC"P":BEQ emph
 380  CMP#ASC" ":BEQ emph
 390 .not_def:LDA buffer+1
 400  CMP#ASC".":BNE not_dot
 410  LDA buffer+2
 420  CMP#ASC"[":BEQ may_be_dot
 430  CMP#ASC" "+1:BCC may_be_dot
 440  CMP#ASC"0":BCC not_dot
 450  CMP#ASC":"+1:BCS not_dot
 460 .may_be_dot:LDA buffer:PHA
 470  CMP#ASC"_":BEQ emph2
 480  AND#&DF
 490  CMP#ASC"@":BCC not_dot2
 500  CMP#ASC"Z"+1:BCC emph2
 510 .not_dot2:PLA
 520 .not_dot:LDA buffer
 530  CMP#ASC":":BEQ stop_emph
 540  CMP#ASC" "+1:BCC stop_emph
 550  CMP#ASC"=":BEQ stop_emph
 560 .skip_checks
 570  CMP#13:BNE not_carriage_return
 580  STX quote+1:STXmode+1
 590 .stop_emph
 600  PHA:LDA#ASC"F":BNE set_emph
 610 .not_carriage_return
 620  LDA buffer:BPL not_colour_code
 630  STAmode+1:LDA#32
 640 .emph:PHA
 650 .emph2:LDA#ASC"E"
 660 .set_emph:PHA:JSR esc
 670  PLA:ADC#2:JSR esc:PLA
 680 .not_colour_code
 690  CMP#ASC"£":BNE insert
 700  TXA:JSR character_set
 710  LDA#35:JSR insert
 720 .character_set_0:LDA#0
 730 .character_set
 740  PHA:LDA#ASC"R":JSR esc:PLA
 750 .insert:JSRoldinsert
 760  PHP:CLI:NOP:NOP:PLP:BCS insert
 770  LDAbuffer:RTS
 780 .esc:PHA:LDA#27:JSR insert
 790  PLA:BCC insert
 800 .def:OPT FNequs("FED")
 810 .setup:SEI
 820  LDA&22A:STA oldinsert+1
 830  LDA&22B:STA oldinsert+2
 840  LDA#my_insert MOD256:STA&22A
 850  LDA#my_insert DIV256:STA&22B
 860  CLI:RTS
 870 ]:NEXT:ENDPROC
 880 DEFFNequs(A$)
 890 $P%=A$:P%=P%+LENA$:=T
 900 DEFPROCos($os%):LOCALX%,Y%
 910 X%=os%MOD256:Y%=os%DIV256
 920 CALL&FFF7:ENDPROC
```

Get it right!

```
 10 =    0 0 | 320 = CF00 6 |
 20 =    0 0 | 330 = 5ED9 5 | 630 = 325F 0
 30 =    0 0 | 340 = 5C61 2 | 640 = D0FC 2
 40 = 26F1 1 | 350 = 9EA4 0 | 650 = 7B2E 9
 50 = 4398 6 | 360 = F91B 1 | 660 = 2A0E 2
 60 =  89A A | 370 = 5DD2 5 | 670 =  EB4 5
 70 = F0D0 B | 380 = E640 5 | 680 = 3E82 4
 80 = 2376 C | 390 = 1C21 1 | 690 = F2F6 2
 90 = 4850 4 | 400 = 9DC5 A | 700 = 3643 B
100 = FD2E 8 | 410 =  287 E | 710 = AFB5 3
110 = DB18 4 | 420 = 30B1 7 | 720 = 4DA0 7
120 = F801 A | 430 =  7E1 1 | 730 = E64A A
130 = 9D2F 1 | 440 = 698D A | 740 = E950 7
140 = 54BE B | 450 = 2DF5 8 | 750 = EB76 B
150 = BFBC F | 460 = 7DBF 3 | 760 = 7C43 F
160 = E2B0 B | 470 = 5CAA 2 | 770 = D7F4 4
170 =  F6E 1 | 480 = 532E 8 | 780 = 8B99 9
180 = 188A 3 | 490 = 9F09 F | 790 = 2CEA 7
190 = EFCC 2 | 500 =  B2B 8 | 800 = 516E 7
200 = FB56 A | 510 = 33CA A | 810 = 75D4 3
210 = 6944 5 | 520 = 1FC7 7 | 820 = 25FE 1
220 = 3EA3 D | 530 = 84FD 3 | 830 = 24BB F
230 = A926 E | 540 = B3D8 B | 840 = F156 C
240 =  F07 6 | 550 = EC62 E | 850 = C7DF 5
250 = FB0C A | 560 = D3C7 C | 860 =  188 A
260 = 6291 8 | 570 = 5F0B A | 870 = 953B 0
270 = 19F0 5 | 580 = 363F C | 880 = E594 4
280 = 94E8 D | 590 = ECF9 F | 890 = 3E63 0
290 = 955D 6 | 600 = 3D79 6 | 900 = 42DD 1
300 = A57D 4 | 610 = C305 5 | 910 = CB45 D
310 = AE4F F | 620 = E7D6 2 | 920 = 4C80 3
```

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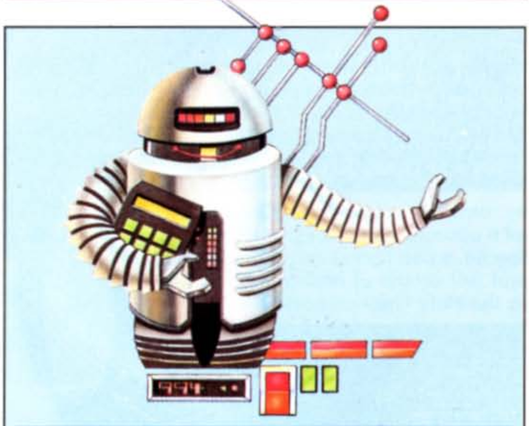

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- ***Escape**: A final check on progress*

ORDER FORM

Please supply Fun School 2 on ☐ tape at £9.95* ☐ 3in disc at £12.95*
For ages: ☐ Under-6s ☐ 6-8 years ☐ Over-8s
Amstrad CPC version
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Signature

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Order Hotline: 0625 879920 (Credit card only)

MU1

Watford Electronics

Jessa House, 250 Lower High Street, Watford WD1 2AN, England
Tel: Watford (0923) 37774 Tlx: 8956095 Fax: 01 950 8989
Shop Hours: 9am to 6pm (Mon.-Sat.) Thursdays 9am to 8pm
All prices exclusive of VAT; subject to change without notice & available on request.
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Acorn
The choice of Experience

WE
The choice before and after the experience

Archimedes micro

System	Basic	Mono	Colour
305	£699	£759	£909
310	£829	£875	£1025
310M	£879	£925	£1099
440	£2399	£2449	£2595

(Securicor carr. £10 on Micros)

FREE PRINTER OFFER

With every Archimedes Micro purchased from us this month, we are giving away absolutely **FREE a Panasonic** KX-P1081 Dot Matrix **PRINTER** and an Archimedes **PRINTER LEAD** worth **£160**. If you already own a printer, then simply phone in for alternatives.
. . . and with every Archimedes 440, we are also giving away absolutely FREE the Printer AND Acorn's DEVELOPERS' TOOLBOX together worth £360.

● 0.5 Mb RAM for 305	£149
● Podule Backplane	£37
● ROM Podule (Computer Concepts)	£48
● ROM Podule (C C) with Battery Backup	£59
● ROM Podule (takes five 8 bit ROMs, of 16, 32, 64 or 128K)	£56
● Archimedes Ref Manual	£29
● 2nd 800K floppy disc drive (for 305, 310 & 410)	£118
● Econet Network Board	£40
● Backplane for 2 podules, with fan (305, 310)	£39
● New Backplane for 4 podules	£39
● I/O Podule (with User port, Analogue port & 1MHz bus)	£85
● MIDI add-on to I/O Podule	£38
● MIDI Expansion Card	£66
● Real time Video Digitiser (Watford)	£249
● Sound Sampler (Armadillo)	£105
● 20 Mb Hard Disc & Controller Card	£469
● ARM Assembly Lang. Prog. Manual	£12

WORDPROCESSORS

Wordwise +	£18	Pipedream	£89
Image Writer	£25	View	£49
Interword ROM	£35	Viewspell	£32
1st Word Plus	£79	ViewIndex	£12
Archie Spell Master	£49		

DATABASES

AlphaBase	£39	Viewstore	£49
System's Delta Plus			£60

SPREADSHEETS

Intersheet ROM	£35	Viewsheet	£49
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GammaPlot	£30	Interchart ROM	£22

INTEGRATED PACKAGES

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PC EMULATION Pack

(for 310, 410 & 440), including MSDOS 3.21 £79

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Interchart	£25	Gamma Plot	£30
Artisan	£31	Gamma Plus	£60
Support Disc	£17	**Autosketch**	£69
Toolkit (Beebug)	£32	Toolkit (Clares)	£31
Arc Termulator	£59	Zarch	£16

Now available on DISC Computer Concepts' Software for Archimedes

Inter-Word Disc	£27
Inter-Sheet Disc	£27
Inter-Chart Disc	£17
Spell-Master Disc	£48

LANGUAGES

ANSI 'C'; ISO-PASCAL; FORTRAN 77;	£95 each
Cambridge LISP; PROLOG X	£181 each
Archimedes Assembler	£189
TWIN EDITOR	£27

0% (APR) FINANCE

*For a limited period, Watford Electronics are able to offer the Archimedes range of microcomputers at **0% (APR)** finance. Credit facility available subject to status. Please inquire for further details.*
(Watford Electronics are Licenced Credit Brokers)

Archimedes to BBC SERIAL LINK

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers. Using this package it is possible to transfer any data from the BBC to Archimedes at upto 19200 baud.
By far the easiest way to transfer data to your new computer.

Only £25

Archimedes 5¼"/3½" Disc drive Interface

With this interface it is possible to connect almost any 5¼"/3½" disc drive with its own power supply to the Archimedes. NO SOLDERING is involved. Supplied complete with necessary lead.

Only £19

Note: This is not simply a lead. Attempting to connect an external disc drive by direct connection may result in damage to your Micro.

New

By Popular demand we are now supplying refurbished and fully guaranteed BBC Micro Model B with Disc Filing System

(Please telephone for price & availability)

The 80186 Co-Processor

This package consists of the Master 512 board, Watford Co-Pro Adaptor, 1770 Disc Upgrade and Acorn ADFS. This is a complete package, with its own power supply, ready to interface with your BBC Micro. The Master 512 board using the 80186 16 bit Processor at 10MHz and running Digital Research DOS Plus, gives a high degree of IBM compatibility at an extremely reasonable price. Included in the 512k package is a mouse and the amazing Digital Research GEM suite of software; GEM Paint, GEM draw and GEM desktop giving a complete Mouse Icons environment (All other GEM packages will work on the 512k). Famous packages that will work with the 512k board include Wordstar, Dbase II, Lotus 123 and many others. The only requirement to upgrade any BBC Model B to this system is you must have twin 80 track disc drives.

New low price **£175**

CREDIT TERMS now available.
Please telephone or write in for further information.

BBC MASTER

MASTER 128K Micro incl. Acorn's: View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus £125 worth of FREE OFFER (see below) **£379**

SPECIAL OFFER

FREE . . . £105 worth of Hardware & Software

*Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control and **Watford's** 3½", double sided 1 Megabyte (unformated) single disc drive complete with cables, ready to connect to the micro – with every BBC Master purchased from us this month.*

BBC MASTER with Turbo Board + above SPECIAL OFFER £513

*512K Processor Add on Board "inc. Mouse and GEM package" **£95***

BBC MASTER plus 512K 80186 Co-processor Board (incl. Mouse and GEM package) plus the above £105 worth of SPECIAL OFFER £449

ADD-ONs & ACCESSORIES

Turbo 65C102 Add-on Module	£119
Econet Module for the Master	£40
Twin ROM Cartridge for Master	£7.50
Quad ROM Cartridge for Master	£11
Universal Processor Adaptor	£75
Master Reference Manual I	(No VAT) £14
Master Reference Manual II	(No VAT) £14
Master Advance Ref. Manual	(No VAT) £19
64K Upgrade Kit for B+	£32
Acorn 1770 DFS Kit complete	£49
ECONET Upgrade Kit for BBC	£42
ALL ECONET UPGRADES Available	
ARIES' Professional IEEE Interface	£238
Acorn IEEE Interface Complete	£265
Morley Teletext Adaptor with ATS Rom	£99
Filestore E01S	£899
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Filestore E60S	£1080
Ecolink	£270

BBC MASTER COMPACT

System 1	Standard Package	£299
System 1A	System 1 + TV Modulator	£315
System 2	System 1 + Green Hires Monitor	£345
System 3	System 1 + Medium Res Colour Monitor	£469
RS232 Kit for BBC Compact		£25
Additional 3½" Drive for BBC Compact		£90

(Securicor carriage £7)

65C102 2nd PROCESSOR

This amazing package consists of the Acorn 65C102 'Turbo' Board, the Watford Co-Pro Adaptor and Acorn 1.2 DNFS ROM. The 'Turbo' board, running at 4MHz with 64k of additional RAM will increase the speed by between 50 and 200% depending on the application running, and allow a BASIC program of upto 44k in any screen mode. Simply by plugging in the Co-Pro and the DNFS ROM with its special Tube host code and you massively increase the power of any Model B. This is a complete package, with its own power supply, ready to interface with your BBC Micro.

£159

Continued →

SPECIAL CHRISTMAS OFFER

FROM

Watford Electronics

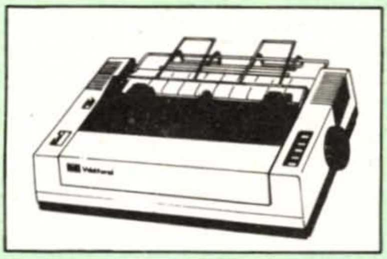
ACORN ARCHIMEDES

The Archimedes range of micros brings new levels of performance in all respects. Acorn's breathtaking technology is breaking new ground with advanced application software for business, design and desktop publishing.

WITH EVERY ACORN ARCHIMEDES PURCHASED

Watford Electronics

WILL GIVE YOU A CHRISTMAS PRESENT OF A FREE PANASONIC PRINTER



Panasonic KX-P1081

The Panasonic 1081 dot matrix printer handles text printing at speed, features business quality printout and links beautifully with graphics, CAD and DTP software.

With every Archimedes Micro purchased from us this month, we are giving away a free Panasonic KX-P1081 printer and an Archimedes Printer lead worth £160.
With every Archimedes 440 we are giving away the Panasonic KX-P1081 and Acorn's Developer's Toolbox – together worth £360.
For full details of our Archimedes range of micros and prices see page 1 of our advert. 0% finance applies to this offer.

Z88 Sinclair's Portable Micro

The worlds first, truly portable Micro. It is A4 size, only an inch thick and weighs under 2lbs. Ideal for use when travelling or as a personal organiser.

Only: £239

FREE

With every Z88 purchased from us this month, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

ACCESSORIES

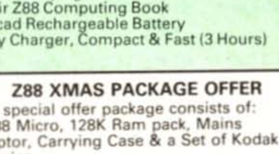
Mains Adaptor	£8.65
32K RAM Pack or 32K EPROM Pack	£17.35
128K RAM Pack or 128K EPROM Pack	£43.40
512K RAM Pack	£169
Z88 Spellmaster for Pipedream	£51
Z88 to BBC Link	£21.70
Z88 to PC Link II	£30
Z88 EPROM ERASER	£34.75
Serial Printer Cable	£8.65
Parallel Printer Cable	£24.00
Z88 Modem	£145
Z88 Soft Carrying Case	£8.50
Sinclair Z88 Computing Book	£9.95
AA Nicad Rechargeable Battery	£1.50
Battery Charger, Compact & Fast (3 Hours)	£6

Z88 XMAS PACKAGE OFFER

This special offer package consists of: A Z88 Micro, 128K Ram pack, Mains Adaptor, Carrying Case & a Set of Kodak batteries.

Only £289

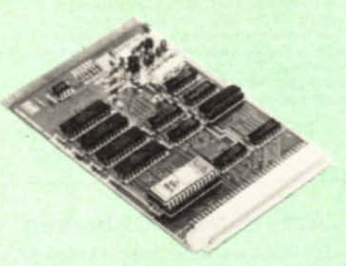
CO-PRO Adaptor



With this Watford's Co-pro Adaptor unit, you can now attach any BBC Master coprocessors to your original BBC B.
Use the super fast Turbo Board with your BBC B, it is much faster than the 6502 2nd processor superseding it.
With the 512K addon your standard BBC machine achieves IBM PC compatibility at a realistic price running GEM, Lotus 123 and many other programs. Included with the 512k package is a high precision mouse and the Digital Research GEM suite of software; GEM Desktop, GEM Write GEM Paint. This requires both the 1770 DFS and the ADFS to be fitted to your computer.
To use other co-processors you require a BBC B with DNFS 1.20 or higher, or BBC B+ fitted with 1770 DFS 2.20 or greater. Co-processors work exactly like a second processor.
Master owners may use Co-Pro to add a second Co-processor externally.
Watford, brings power to your BBC at only:

£35 (carr £5)

Archimedes Real-Time Digitiser



Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air television signals may also be digitised via a video recorder or TV tuner.

Once captured, Video images can be stretched, squahsed, rotated, stored on disk, printed, or used by applications software.

Applications include desktop publishing, graphics, animation, image analysis and recognition, medical imaging, automatic inspection and measurement, databases, interactive video, remote transmission of pictures via a modem, movement detection ... or anything else you can think of!

SPECIFICATION

SOFTWARE

All the driver software for the digitiser is contained in a ROM on the podule. Facilities provided include:

- Grabbing of images to the screen or dumping to memory.
- Continuous grabbing and display for previewing or camera alignment.
- 'Hot key' grabbing – pressing a (configurable) key combination grabs and displays an image on the screen while another program (e.g. paint software such as Artisan) is running.
- Scaling (zoom/shrink) any section of an image to any size in X and Y directions, with optional X/Y flip, window clip and logical (AND/OR/XOR) plotting.
- Rotation and scaling to any angle and size, rotating about any point, with optional window clip, and logical (AND/OR/XOR) plotting.
- Very versatile matrix printer screendump facility for Epson FX, LQ and EX compatible printers – pictures can be printed to ANY size (including multiple sheets) at any orientation, using any available printer density and one of six internal sets of dot patterns, or with user definable patterns (pattern editor supplied). The screen-dump can also be used for general purpose graphics screen printing.
- Pixel value lookup tables: pixel values can be passed through a user defined lookup table to allow contrast enhancement, thresholding pseudo-colouring etc.
- Smoothing and noise spot removal to enhance image quality.
- Creation of sprites from all or part of a digitised image.
- Saving and loading of digitised images in compressed format.
- Combination of pictures by adding, avaraging, subtracting, multiplication etc.
- Much faster versions of the Arthur *ScreenLoad and *ScreenSave commands.

Software facilities are accessed via operating system star (*) commands and SWI calls. High resolution screen modes using MultiSync type monitors are supported.

UTILITY DISK

A disk is included, containing sample pictures, examples and utility programs including the following:

- Colour image grabbing using colour filters with monochrome or colour cameras, including colour balance adjustment and scaling facilities.
- Pattern editor for 2 colour display modes and printer screendumps.
- 512 line interlaced display for non MultiSync monitors.
- Thresholding to create two colour images.
- Capture and replay of animated sequences.
- Several example programs illustrating the use of digitiser software.

RESOLUTION

Images are digitised to 512 (h) x 256 (v) pixels, and then scaled to fit the Archimedes' screen. It is possible to digitise to 512 x 512 pixels if the picture is stationary for about 0.1 second. 512 x 512 images can either be displayed on a MultiSync monitor, or on a normal monitor using interlacing.

Pictures are digitised to 64 levels of grey (6 bits). Note, however, that it is only possible to display all 64 levels on a monochrome monitor, or a colour monitor which has a composite (CVBS) input. For this reason, the Philips CM8533 monitor is recommended instead of the standard Archimedes monitor. It is also possible to connect both a colour and a monochrome monitor at the same time.

Any 2,16 or 256 colour graphics mode can be used to display digitised pictures. In two colour modes, grey levels are represented using dot patterns, which may be redefined if required (a pattern editor is supplied). **Cont.**

SPEED

Video fields are captured in real time (1/50th sec.), and then transferred to Archimedes' memory or the screen. The grab/display rate is dependant on the screen mode and picture size, up to 25 fields per second for quarter screen images, or 12.5 per second for fullscreen (Mode 9).

HARDWARE

The digitiser is a single width podule, with a BNC socket on the rear panel for the video input, which may optionally be terminated via a link. There is 128K of on-board memory to store the digitised image, and a 32K ROM on the podule contains all the driver software.

Automatic video level control and black level clamping circuitry is used to ensure that the optimum contrast is obtained from a variety of video sources. A filter is included to avoid patterning effects when using colour sources.

Price £249

Watford Dealers' List

UNITED KINGDOM

Alpha Microtec Ltd, 321 Stratford Road, Shirley, Solihull, West Midlands. Tel: 021-745 8998.

Badger Micros (Devon), Badger's Hill, Southerton, Ottery-St. Mary, Devon EX11 1SE. Tel: 0395 68516.

Beebug Retail, Dolphin Place, Holywell Hill, St. Albans.

Cambridge Computer Store, 4 Emmanuel St., Cambridge CB1 1NE. Tel: 0223 358264.

Cirkit Distribution Ltd, Park Lane, Broxbourne, Herts.

HCCS, 575-583 Durham Road, Low Fell, Gateshead, Nr. Newcastle Upon Tyne. Tel. 091 4870760.

Mancomp Ltd, Printworks Lane, Levenshulme, Manchester. Tel: 061-224 1888-9888.

Microman Computers, Pasture Lane Farm, Pasture Lane, Rainford, St. Helens, Merseyside WA11 8PU. Tel: 074488 3667.

The Computer Depot, 205 Buchanan Street, Glasgow G1 2JZ. Tel: 041-332 3944.

Verospeed Ltd, Boyatt Wood, Eastleigh, Hants.

OVERSEAS DEALERS

*Absolute Electronics, Rewal House, 208-210 La Trobe Street, Melbourne, 3000, Victoria, Australia. Tel: (03) 663 2411.

Computer Distribution Company, Parklaan, 47, 8-9300 Aaist, Belgium.

E.B.N., Elisenstrasse 13, 1000 Berlin 41. Tel: (030) 7952057.

Lendac Data Systems, Unit 31, IDA Enterprise Centre, Pearce Street, Dublin 12. Tel: 710796.

Lindis International Ltd, Wood Farm, Linstead Magna, Halesworth, Suffolk. Tel: 098 685 476.

Scientex P.V.B.A., Zilversmidstraat 2, B-2000 Antwerpen, Belgium, Tel: 03 233 59 06.

Techno-matic Data, Holbergsgade 19, 1057 Kobenhavn K, Denmark.

*Velobyte, Scheaedyksadyk 5a-6a, 3011 EB Rotterdam, Holland, Tel: (010) 413 8197/414 5171.

Viking Tecno, Vestergade 12.1, 9620 Aalestrup, Denmark, Tel: 08 642522.

*Acorn/Watford Referral Centres.

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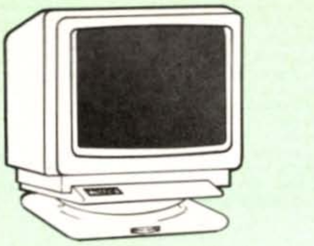
Microvitec Monitors
Panasonic Printers

Continued ⟶

MONITORS & SWIVEL BASES



All Monitors are supplied complete with BBC connecting leads FREE.

MICROVITEC 14"

● 1431 – Standard resolution as used on the BBC television computer programme	£175
● 1451 – Medium resolution, suitable for word processing in mode 0	£219
● 1441 – High res, exceeds the capabilities of the BBC micro	£359
● 1431AP RGB + PAL and AUDIO	£199
● 1451AP RGB + PAL and AUDIO	£255
● **2030 CS 20" Med Res**	£380
● **2040 CS 20" Hi Res**	£675
● Dust Cover for Microvitecs	£5.50
● **Touchtec 501 Touch Screen**	**£239**

TAXAN 12" & 14"

● **TAXAN Super Vision 2 Type 620** Hi-res RGB Colour monitor. Ideal for Wordprocessing	£263
● **TAXAN 14" Multisync 770 Plus** – An autoscanning Ultra high res, colour monitor. Ideal for Archimedes, IBM & Compatibles	£449

NEW

EIZO 14" Flexscan 80605

£449

(For full details read the review in this issue of The Micro User).

● **NEC JC-1402P 14"** Multisync II
Ultra Hi-res Intelligent Colour monitor. Auto scans frequencies between 15KHz to 35KHz. Text switch provides 7 colours for Database & wordprocessor. £459

PHILLIPS

● BM7502 12" Hi-res Green Monitor	£65
● CM8833 14" Med. Res Colour Monitor	£219

STAR BUY

● **PHILLIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor – supplied complete with RGB, SKART and Audio/Phono Inputs. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. Has Composite Video Input. (Please state the type of Connecting Lead you require).

ONLY £195

Dust Cover for Phillips Monitors £6

SPECIAL OFFER

AMBER MONITOR

BT MERLIN/Acorn 12" Hi resolution Amber monitor. Ideal for wordprocessing. Consealed front panel mounted controls. Illuminated mains on/off rocker switch. Supplied complete with BBC Cable.

Only £49

(Offer valid while stocks last)

N.B. carriage on Monitors **£7** (securicor)

A range of IBM PC Compatible monitors, both monochrome & Colour are now available. Please write in for our descriptive PC brochure.

SPARE LEADS

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

By placing your monitor on one of our professional swivel bases (see monitors drawing on the left), you gain the freedom to adjust the monitor viewing angle to suit your needs and thus alleviate eye strain and reduce back stress. The front mounted adjustable control dial makes adjusting the monitor viewing angle very simple.

for 12" Monitors **£7** (carr. £2.50)
for 14" Monitors **£10** (carr. £2.50)

Anti-Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for all wordprocessor users. Hundreds of these screens are in daily use in various branches of one of the leading High Street banks.

£12

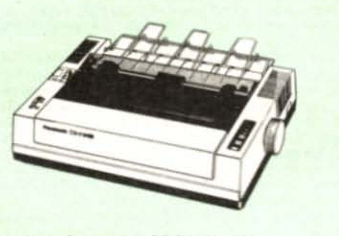
TAXAN KP-815 PRINTER

80 column, Bi-directional, 160 CPS, (NLQ 24cps); Friction & tractor feed + paper roll holder as standard; Epson FX compatible.

Offer Price £155

Taxan KP915 132 Column Printerr (carr £7)	£275
RS232 Interface	£49
RS232 Interface with 2K Buffer	£69
RS232 Interface with 16K Buffer	£89

Panasonic KX-P1081



Attractively finished in BBC beige. Bi-directional, logic seeking. Has IBM and Epson RX compatible command calls. Speed: 120CPS draft mode, 24 CPS NLQ mode. Character width range from 5 cpi to 17 cpi. Upto 40 downloadable characters. Functions include, Proportional spacing, Justification, centering and left & right ranging.

(Price inludes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every printer purchased from us).

Special Price: **£145** (carr. £6)

Optional RS232 Interface: £39

Panasonic KX-P3131 Daisy-Wheel Printer

Low-cost, high performance; Bi-directional, Logic seeking, Proportional spacing, 10, 12 & 15 CPI, Speed 17CPS. 6K Buffer.

Only **£255** (carr. £7)

Tractor Feed	£90
Daisy Wheel (various)	£12
Ribbons: Standard **£4.50**; Long Life **£7**	
Extra 32K Printer Buffer (internally fitted)	£13

RS-232 GENDER CHANGERS

Male to Female	£4.95
Female to Male	£4.95
Male to Female	£4.95

Panasonic KX-P4450 LASER PRINTER

Latest technology at affordable price. Prints 11 pages a minute, Two A4 size paper bins, Serial & Parallel ports, 512K Buffer – expandable to 1.5Meg, 15 Character LCD Display, Diablo 630, Epson FX-286, IBM Proprinter, HP Laserjet emulations, 5K pages per month duty cycle.

ONLY £1,625

Toner for KX-P4450 **£29**

NEC P2200 PINWRITER

24 pin; 80 column; 168CPS – 56CPS LQ; Epson LQ compatible, 7K Buffer; 7 resident FONTS, Friction & Tractor feed, front load single sheet feed, etc.

Price: £269

FREE Price includes a Free BBC Cable.

Cut Sheet Feeder	£59
Pinwriter Serial Interface	£55
Additional Font Cartridge	£25
NEC P2200 Pinwriter Ribbon	£6

NEC PINWRITER P6/P7 Plus

The Ultimate matrix Printer for Business.

24pin printhead; Print speed, 265cps Draft, 90cps LQ; Inbuilt Tractor & Friction feed; A paper park & low tear facility; 20 inbuilt FONTs; A font cartridge facility; 8K of printer buffer; colour option available.

P6 Plus 80 columns	£439
P7 Plus 136 columns	£575
Cut Sheet Feeder	£125
Colour Option	£74
Serial Interface	£73

EPSON PRINTERS

EX800	£405	LQ850	£430
EX1000	£545	LQ1050	£589
FX850	£315	LQ2550	£839
FX1000	£425	LX800	£175
GQ3500 Laser	£1249	SQ2500	£975
LQ500	£285		
Star LC10	**£175**	**LC10 Colour**	**£225**

PLOTTERS

Hitachi 672 Colour Plotter	£475
Plotmate Plotter A4S	£379
Plotmate Plotter A3M	£549

CUT SHEET FEEDERS for

EX800 **£149**; EX1000/LQ2550 **£210**; FX800 **£149**; FX1000 **£179**; LQ/LX800 **£139**; LQ500 **£75**; LQ850 **£135**; LQ1050 **£175.**

TRACTOR FEED for

EX800/1000 **£85**; LQ800 **£44**; LQ850 **£69**; LQ1050 **£85**; LQ2500 **£195**

ACCESSORIES

● EX800/1000 Colour Option	£55
● EX800/1000 Colour Ribbon	£18
● LQ2500 Colour Option	£65

(Securicor Carriage on Printers £7

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer.

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

Universal Printer Sharers/Changers

Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spagetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments.)

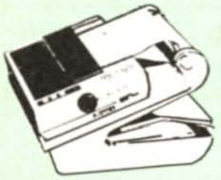
Connects	**Serial**	**Centronics**
2 to 1	£22	£23
3 to 1	£30	£32
5 to 1	£40	£42

(Cables extra at £6 each. Please specify type required when ordering)

INTEGREX COLOUR JET PRINTER

● Colour Jet 132 Printer	**£515**
● Paper Roll	**£6**
● Screen Dump Software	**£10**
● Colour Cartridge	**£14**
● Black Cartridge	**£8**
● 100 A4 OHP transparencies	**£55**
● 8K Serial Interface Optional	**£99**

Professional Printer Stand



This new professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Additional facilities include: Easy access to paper from both sides, used with both top and bottom feed paper and with its dial controlled paper feed system with adjustable deflector plates it ensures smooth paper flow and automatic refolding.

80 Column version £23 *(carr. £2.50)*
132 Column version £26 *(carr. £2.50)*

PRINTER LEADS

BBC Centronics 4' long	**£5**
BBC Centronics 6' extra long	**£7**
Compact's Special Centronics Lead	**£7**
Archimedes Printer Lead 1 meter	**£7**
IBM Parallel Lead 1 meter	**£7**
Double Ended 36 way Centronic Lead	**£9**
RS232 Leads (Various)	**P.O.A.**

PRINTER RIBBONS & VARIOUS DUST COVERS

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
IBM PCs pair	–	£6.00
Brother HR15/20	£3.00	£5.00
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£7.50	£5.00
RX/FX80/85/800/MX80	£3.90	£4.95
RX/FX100/1000	£5.75	–
Kaga/Taxan KP810/815	£4.90	£4.00
LC10 (Black)	£4.25	£5.00
LQ500/800	£3.75	£5.00
LQ1050/LQ2500	£8.50	£5.50
LX80/86/800	£3.80	£4.50
M1009/GLP	£3.80	£3.75
Panasonic KX1080/81	£4.00	£4.75
SQ2500	£23.00	£5.50
Star NL10	£3.75	£4.50
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PVC. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Listing Paper (Perforated)

● *1,000 Sheets 9½" × 11" Fanfold Paper*	***£7***
● *2,000 Sheets 9½" × 11" Fanfold Paper*	***£12***
● *1000 Sheets 9½" x 11" NCR 2 Part Fanfold*	***£19***
● *1,000 Sheets 15" × 11" Fanfold Paper*	***£9***
● *1000 Sheets true A4 Fanfold Paper*	***£11***
● *2000 Sheets true A4 Fanfold Paper*	***£19***
● *Teleprinter Roll (Econo paper)*	***£4***

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50. 2K Sheets £3.00

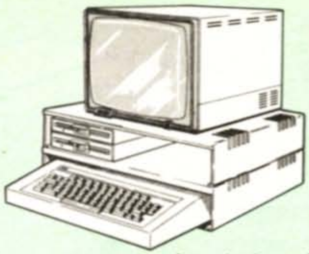
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 × 36mm (Single Row)	***£5.00***
1,000 90 × 36mm (Twin Row)	***£4.90***
1,000 90 × 49mm (Twin Row)	***£7.50***
1,000 102 × 36mm (Twin Row)	***£6.25***

Carriage on 1,000 Labels £1.00

PLINTHS FOR BBC MICRO, MASTER & PRINTERS

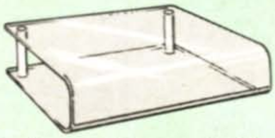


Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	**£12** (carr. £2)
Double BBc Plinth	**£20** (carr. £3)
Printer Plinth	**£12** (carr. £2)
Single Master Plinth	**£13** (carr £2)
Double Master Plinth	**£24** (carr £3)

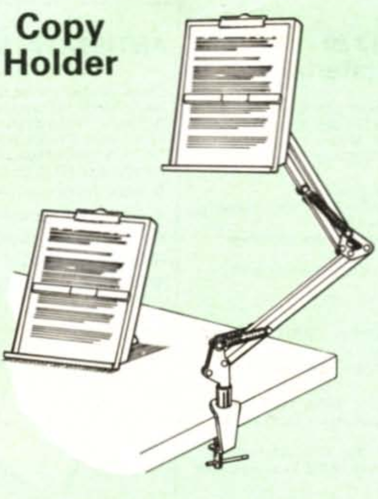
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand. The printer sits on top and the fanfold paper rests neatly underneath, thus occupying the same space as the printer footprint.

Only: £16 (carr. £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£10** (carr. £2)
Angle poise **£14** (carr. £3)

MEGABUFFER 256

The Smallest 256K Printer Buffer Unit in the world **38mm x 130mm x 134mm**.

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. It allows the computer to print 256,000 character in a short time thus freeing the computer very quickly. In short it makes light work of printing large documents, screen dumps, etc. It is extremely simple to connect. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatibility with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in test unit for both the buffer & your printer.

In conclusion it can safely be said that MEGABUFFER 256 is the ultimate printer Buffer for both the amateur and professional user.

Only £149 (carr £2)

OKIMATE COLOUR PRINTER

The first ribbon transfer printer in its price range which offers fully versatile colour or black printing. A 24 element print head produces more than 100 shades with exceptional clarity. Ideal for use with Quest Paint or AMX Super Art.

Only: **£119**

BBC Screen Dump	**£10**
Colour Ribbon	**£6**
Black Ribbon	**£6**

THE EPSON RX-FX-KAGA PRINTER COMMANDS REVEALED

So you bought yourself a new printer, because the salesman in the shop showed you how clever it is and impressed you with all sorts of printouts to show its capabilities – he may even have offered you a special price.

However, now that you have got it home and connected it to your BBC microcomputer, you are wondering how to make it perform these magical tasks. The manual seems to give no clues, and when you type in the example programs, the computer throws the LPRINT statements back in your face.

Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out. Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible Printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from BASIC and Wordwise.

It describes in detail how to obtain the maximum in graphics capability from your printer and includes full indexes allowing you to cross index the numerous commands. Every command is explained in detail, with an accompanying BBC Basic program and an example of its use from Wordwise.

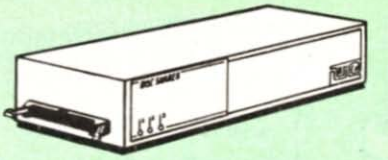
£5.95 (No VAT)

VISA

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

Continued ⟶

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system. Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Launch Price: **£65** Price includes 3 Cables

NOW WITH EXTRA FEATURES AT NO EXTRA COST – Watford's latest DFS 1.44

- Incorporates Acorn's Official Tube Host Code so that those with 2nd processors no longer need to waste a ROM socket on the DNFS.
- Option to DOUBLE the speed of BPUT and BGET.

WATFORD's & ACORN's SINGLE DENSITY DFS

Watford's popular and widely acclaimed DFS has now been available for six years and has gained a large following amongst serious and educational users of the BBC Micro. Owners of Acorn or any other standard DFS can upgrade to our "Ultimate" DFS merely by replacing their DFS ROM. See below for this upgrade. ***(P.S. Watford's highly sophisticated DFS is fully compatible with Acorn standard DFS). (while Acorn's 1770 DFS is fully compatible with Watford's Mk II DDFS)***

● *Complete Disc Interface Kit including DFS ROM and fitting instructions*	**£48**
● *Acorn's 0.90 DFS Kit complete*	**£49**
● *DFS Manual (Comprehensive)*	*(no VAT)* **£6.95**

(P.S. Our DFS manual is the only comprehensive Manual available for the BBC micro and covers both Acorn & Watford DFSs).

● *Watford's sophisticated DFS ROM only*	**£16**
● *We will exchange your existing DFS ROM for Watford's Ultimate DFS ROM for only*	**£12**

● *DNFS ROM only* **£17** ● *ADFS ROM only* **£25**

NEW

Watford's MkII 1770 Double Density DFS Interface

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features:

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!

If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only **£30.00.**

● Special introductory offer	**£39.00**
● DDFS Manual	(No VAT) **£6.95**
● We will exchange your existing DFS Kit for our sophisticated DDFS for only	**£25.00**

Please note, as the MkII DDFS is a hardware and software upgrade, it is not possible for existing Watford DDFS users to simply exchange their ROM for the new version.

DUST COVERS (For our Disc Drives)

Single CLS (without PSU) **£3.20** Twin CLD (without PSU) **£3.85**
Single CS (with PSU) **£3.95** Twin CD (with PSU) **£3.90**

Special 40/80 Disc Drive/DDFS Mk II Offer

- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both, Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£125** (£6 carr)
(Offer valid while stocks last)

3½" DISC DRIVE OFFER

These top quality 3½" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc. They run directly from the BBC B/Master's own PSU.

● **CLS35 400K Unit**	**£69**
● **CLD35 800K Unit**	**£126**

Mysteries of Disc Drives & DFS Revealed

Are you tired of faulty cassettes, and lengthy loading times? Do you want to upgrade your BBC micro to take discs but you get tied up in the plethora of jargon surrounding the choice and use of these systems.

Then The Mysteries of Disc Drives and DFS Revealed is the book for you. It explains in detail the different types of systems available, how they are installed and how to use them. Many examples are given including pre-written programs to call various functions of the DFS available only through Operating System calls. Different types of disc, 40/80 tracks etc. are all explained. This book is ideal for the beginner confused by the plethora of choice available in the marketplace.

£5.95 (Book No VAT)

DISC ALBUMS

Attractively finished in black leather look vinyl. Stores upto 20 Discs. Each disc can be seen through the clear view pocket.

£4

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of a cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. It is very simple to use. Available in 3½" & 5¼", please specify.

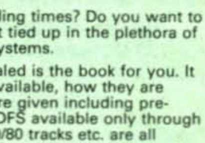
£4

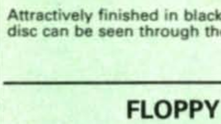
ANTISTATIC LOCKABLE DISC STORAGE UNITS

Gives double protection – Strong plastic case that affords real protection to your discs. Antistatic helps avoid data corruption whilst in storage. The smoked top locks down. Dividers and adhesive title strips are supplied for efficient filing of discs.

● **M35** - holds upto 50 5¼" discs	**£5.00**
● **M85** – holds upto 95 5¼" discs	**£8.00**
● **M25*** – holds upto 25 3 ½" Discs	**£5.50**
● **M50** – holds 50 3½" Discs	**£7.50**
● **M10** – holds upto 10 Data Cartridges	**£15**

* Not lockable





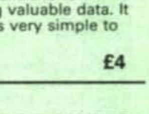
PLASTIC LIBRARY CASES

Holds up to 10 5¼" Discs. **Only £2.00**

DISC PLONKER RACK

When using ones micro, there is a tendancy to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk.

Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. It holds up to eight 5¼" Discs.



Protection at Only: **£2**

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.

The first capacity given in the first column indicates capacity in single density mode. That within the brackets is the capacity in double density mode. All disc drive type numbers start with the prefix "C".

The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.

***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*

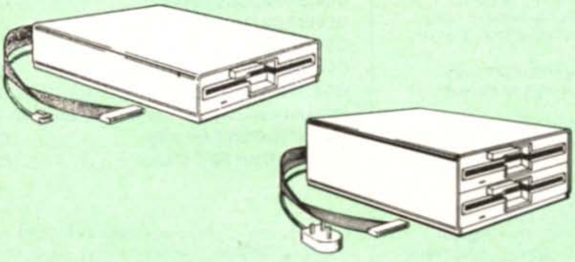
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packages" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. Ideal for Schools & Colleges. We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £5. (At Watford we anticipate your needs of tomorrow, not just today)!

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC, Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with Watford plinth. (Turn to the 5th page of our advert for the Plinths).
P.S. All our 5¼" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
200K (360K)	CLS 200 £89		CS 200 £98	
400K (720K)	CLS400S £82	CLD 400 £168	CS 400S £92	CD400 £188
800K (1.44M)		CLD 800S £162		CD 800S £182

- TWIN Disc Drive Case, complete with Power Supply & Cables **£43**

Securicor carriage on Disc Drives £5 to £6

*Prefix **C** = Cased Drive*
***L** = Less PSU*
***S** = Single*
***D** = Double*

*Suffix **S** = 40-80 Switchable*

e.g. CLS400S = Cased Disc Drive, Less power supply unit, single 5¼" 400K, (720K in double density); Double sided; 40/80 track switchable.

Cable to connect 5¼" Disc Drives to BBC Compact
Single £9 Twin £12
Special Cable to connect both 3½" and 5¼" Disc Drives simultaneously to the BBC Compact £13

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electronics your 3M Appointed Distributor.

● *10 × 5¼" S/S D/D 40 Track Diskettes (744)*	***£6.00***
● *10 × 5¼" D/S D/D 40 Track Diskettes (745)*	***£7.50***
● *10 × 5¼" S/S D/D 80 Track Diskettes (746)*	***£11.50***
● *10 × 5¼" D/S D/D 80 Track Diskettes (747)*	***£11.00***
● *10 × 5¼" 1.6M D/S D/D High Density Discs for IBM XT and AT*	***£19***
● *10 × 3½" S/S D/D 40/80 track Discs*	***£10.00***
● *10 × 3½" D/S D/D 40/80 track Discs*	***£11.75***
● *10 × 3½" High Density Diskettes*	***£35***

TOP QUALITY 3½" & 5¼" DISKETTES

To complement our range of Quality Discs and Disc Drives, WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

● *10 × **M3** 3½" D/S D/D 80 Track Discs*	***£11***
● *10 × **M9** 3½" Double Side High Density*	***£34***
● *10 × **M4** 5¼" S/S D/D 40 Track Discs*	***£5***
● *10 × **M5** 5¼" D/S D/D 40 Track Discs*	***£7***
● *10 × **M7** 5¼" D/S D/D 80 Track Discs*	***£9***
●**10 × M8 5¼" D/S H/D Hi-Density Discs**	**£14**
● *3" Double Sided Discs*	***£2.50** each*

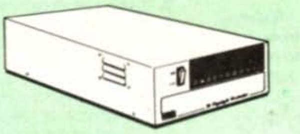
PRICES SLASHED

Special BULK OFFER on 5¼" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£35	£39	£45
● With Sleeves	£38	£42	£48



WATFORD's WINCHESTER DRIVES

Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.

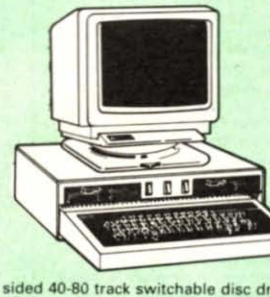
This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a Utilities Disc.

Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!

Compatible with the Master, and the BBc B (with 17 X disc interface).

● 10 Megabyte **£350;** ● 30 Megabyte **£420**

CDP800S CDPM800S



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

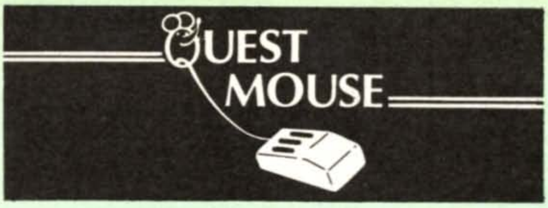
CDP 800S for BBC Micro £192
CDPM 800S for Master £196
DP35-800 for BBC/Master £165
(For DP35-800S spec. see Page 9 of our advert)

(Securicor Carr. £7)

(The above drive units are 2 Megabytes unformatted)

Continued →

NOMINATED FOR
MICRO
BRITISH COMPUTING AWARDS
1987



QUEST MOUSE

The ultimate in Mouse technology, the Watford Electronics Quest Mouse must be the most powerful Mouse package yet produced for the BBC Micro. Featuring state of the art 32K ROM software the Quest Mouse package is filled with features essential to the budding artist. The Quest Mouse is a high precision, low profile and large footprint mouse. It has three large comfortable buttons and its RUBBER COATED STEEL BALL is smooth and easy to use on virtually any work surface. This also eliminates any directional bias that one encounters on the most well-known mouse for the BBC. The Quest Mouse is FULLY HARDWARE COMPATIBLE with the AMX MOUSE so that it will work with any of the AMX range of software.

The two parts of the Quest package are available separately so that existing Mouse owners can upgrade to the Watford's sophisticated Quest Paint software or replace their existing worn out mice for a minimum cost.

QUEST PAINT

The Quest Mouse software is supplied on a PALPROM unit to allow the sophisticated 32K program to be used from a single ROM socket. It is compatible with the BBC B, BBC B Plus and BBC Master Series machines.

The software is used to draw high resolution Mode 1 pictures in full colour. All menu selection and control of the drawing process is performed with the mouse so that you will hardly ever touch the keyboard.

SOFTWARE FEATURES

The software is far too powerful for us to describe it fully in such a small space. Below is a list of the various features. Please write to us for a fully descriptive leaflet.

Disk interface not required. Utilities disk has facility to create and print big screens. Colours applied can be solid, either pattern of user defined pattern. Drawing can use brush or airbrush. Brush shapes can be defined and stored. Airbrush sprays colour/pattern randomly with four jet sizes and even or center spread. Colour cycles. Colour protection to stop particular colours from being overwritten by selected drawing actions. All standard drawing facilities like: rubber, straight pencil lines, triangles, circles, ellipses, rectangles, parallelograms, polygons, etc are provided. All shapes can be solid or just a boundary line. Once a shape has been set up it can be repeated anywhere on the screen. Global colour replace in a rectangle. Powerful fill facility for areas and vertical/horizontal lines. Full cut and paste of rectangular areas with rotation and size with screens from Watford Beeb Video digitiser. Load and Save screens with colour pallet information, save brush and pattern definitions etc.

Take The Guesswork Out of Selecting a Mouse Package
With reviews like this how can you go wrong.

Popular Computing Weekly, 9-11 June '87
"What you actually get for your money is a well built, three button mouse (far superior to the AMX mouse)."
"Overall the combination of a quality mouse and decent art package gives Watford Electronics a real chance of supplanting AMX as mouse supremos."

Micro User June '87
"Quest Mouse and Quest Paint can hold their heads high in the market. . ."

A&B Computing June '87
". . . Watford Electronics, a company famed for excellent hardware add ons and versatile software packages. Called Quest mouse, "this is a very special mouse driven drawing package..."

". . . you will have one of the most comfortable and professionally built mice I have used in a long time. The buttons are responsive, the mouse movement is smooth and without directional bias – a pleasure to use."

"What we have here is probably the best art package there is for the BBC Micro . . ."
"Quest Paint is a major leap forward in BBC programming. . ."
"Quest Paint is an original piece of programming, it is friendly and well endowed with many useful facilities. I would comfortably say it is easier to draw good pictures with Quest Paint than it is with more expensive 'Professional' art packages for the Atari ST and the Commodore Amiga. A recommended buy if you are looking for the best in BBC micro based art packages".

Acorn User, September '87
"The mouse (Quest) performs well in the face of competition from AMX, Wigmore and the rest . . ."
". . . this package represents excellent value for money. If you are interested in art then this program is for you to buy".
"Given time, I can see no reason why Quest Paint shouldn't take on the title of the definitive art package available for the BBC Micro to date".
"All in all, Quest Paint is a very professional package. It contains virtually every feature the budding artist could require".
"What makes Quest Paint so versatile is the addition of a sub-menu which allows you extensive control over each function".
"Until recently, Superart from AMS had been judged as the definitive mode 1 graphics package for the BBC micro. But now it has a serious rival in the form of Quest Paint, from Watford".
"As a measure of what is contained within Quest Paint, I would say it had all the features of Superart plus . . ."
"In most art packages, provision is given for drawing triangles and rectangles. Quest Mouse goes 14 better, allowing any regular polygon of upto 16 sides".
"One facility, not found on any other Art package to my knowledge, is the ability to access a digitiser from within the program". The reviewer concludes by saying, "The result is an extremely comprehensive and professional art package".

John Kilby, Head of Computer Science, Bishop Wulstan High School, Rugby, writes:
"Quest has been an excellent piece of equipment. The problem that seems to occur everyday is that at lunchtime the pupils rush to the computer room to make sure that they are first in the queue for the 'Quest' mouse".

Lt. Col. C.G. Holton, HQ 1 (BR) Corps, BFPO 39, writes:
"As ever your service is superb and the Quest Mouse proves every bit as good as the adverts claim".

Beeblet User Group, New Zealand Oct '87:
"One of its nicer features is that the top menu is done in Mode 0, the drawing itself is in Mode 1. Thus on screen together are two different Modes. A neat way around an old problem".

"PAN is used when a larger than one screen size image is required. The mind boggles at an A3 size drawing".

"I like it partly because of the mouse itself which is smooth and easy to handle but mainly I suppose because of the features I longed for and previously never got. Its easy to use with almost everything at your fingertips from the mouse. The software is simple where needed and complex where complexity is required".

ConQuest

Watford's Quest package is an extremely powerful and flexible drawing package, with very wide and unusual features. However, since its launch various suggestions for even more advanced & powerful facilities were received from the Quest users. ConQuest allows you these more advanced facilities, like, distortion of a cutout to any shape and a full font designer. If you also have a GXR ROM in your machine or you are using a BBC Master then ConQuest will take advantage of this to give ellipses at any angle, sectors and arcs, etc. Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.
Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

QUEST MOUSE & QUEST PAINT	***£49***
QUEST MOUSE, QUEST PAINT, AMX PAGEMAKER & PAGEFONT	***£82***
QUEST MOUSE ONLY	***£25***
QUEST PAINT SOFTWARE	***£32***
QUEST FONT DISC	***£12***
ConQuest 32K ROM Package	***£29***
QUEST MAT	***£3***
Part-exchange your old Mouse for a New QUEST MOUSE for only	***£23***
GXR ROM for BBC Micro	***£22***

N.B.
1. Quest Paint supplied complete with Software in a 32K ROM, Comprehensive User Guide and a Utility Disc.
2. Quest Font Disc has 22 text FONTS for use within Quest Mouse.

MARK II LIGHT PEN

Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted.

Price Only £21
(Price includes FREE software Disc and Operating Manual)

RB2 Marconi Tracker Ball

RB2 (AMX/Quest compatible)	£49
RB2 including Quest Paint	£78

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Software Pack for Compact	£40
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

THE NEW Mk III AMX MOUSE

ONLY: £59 Inc. Super Art package
(carr £1.50)
(Please specify for BBC, Master or Compact)

FREE our popular Colour Art software pack worth £15 with every AMX Mouse package purchased from us.

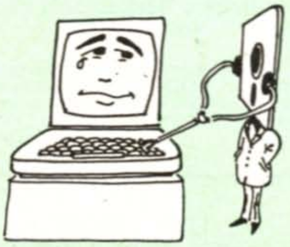
MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX UTILITY Package	£11
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publising software. Works with Keyboard, Joystick or a mouse	£32

We are giving away absolutely FREE, our PAGE-FONT disc with every purchase of STOP PRESS from us.

PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£12

AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£15

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult.
At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.
The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.
This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00

BEEB VIDEO DIGITISER

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.

This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.

Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem.

The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.

Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional * commands. The package i designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.

A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image.

Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £3)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)
(BBC B+ and Master compatible, except Master with Econet)

Magazine Maker

(As seen on TV)
A combination of the Pagemaker and Watford's Beeb Video Digitiser.

Using any video that provides a composite signal and the digitiser, images from a camera or TV can be converted into a graphics screen on the BBC Micro.

They can then be used within Pagemaker to illustrate magazines or newsletters – in fact anything that needs to be created on A4 size paper.

With Pagemaker's many features, a variety of pictures can be composed – the only limit being the imagination.

Pictures can be doctored using Pagemaker's graphics option to produce any number of effects.

Text can be formatted around the digitised photo on screen using the facilities available, which include 16 typefaces, character and pattern definer, text formatting and the ability to load in wordwise and viewfiles plus much more.

Once created the picture can be printed out.

The Magazine Maker is suitable for any use that requires illustrated documents.

Complete Package **£135.00** (carr. £3)

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trail balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE

- ● DATABASE
- ● BEEBCALC SPREADSHEET
- ● BEEBPLOT GRAPHICS

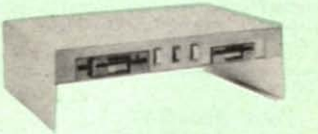
DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features.

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

Disc Drives DP35-800S



A Double disc drive – with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master Series is the 5.25 inch disk, the standard for the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.

To support the present disc drive users, and cope with the future, we have designed our own plinth-mounted disk system – called the DP35 800S, it contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.

The 5.25" disc drive is 40/80 track switchable. For ease of access, the switches are front mounted. DP35-800S has its own power supply, independent of the BBC Micro.

Watford's new plinth enables users to read, write and format disks both in DFS and ADFS format – currently the accepted standard for the Master Compact and the Archimedes, it also enables the user to read disks written for the Archimedes. Ideal for both BBC & Master.

Launch Offer: **£165** (carr. £7)

Continued ⟶

ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Comal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved *FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as the printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on your BBC micro – no flying leads to connect and no soldering. Provision of the on-board ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£80** (carr. £2)

Aries B-12 Sideways ROM Board

This board is extremely well made, simple to install, reliable when fully loaded and compatible with the Aries-B20 and the Aries-B32

The B12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

The B12 system consists of two parts: a large detachable "mother board" which carries the extension ROM sockets and a small "base board" on a short ribbon cable, which plugs into the existing sideways ROM sockets. This two-board design eliminates the reliability problems previously associated with some other ribbon-cable based systems.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost.

Price:	Aries B-12	**£40**
	Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB' or 'HP-IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

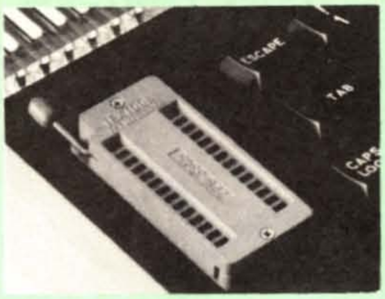
£238 (Carr £3)

EXTERNAL ROM BOARD for BBC MASTER

This external Beige finished, free standing cased unit with its own Power Supply allows you to plug-in upto 12 ROMs and 16K Sideways RAM.

Only £78

SIDEWAYS ZIF SOCKET



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

● Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.

● The low profile of the socket allows unrestricted access to the Keyboard.

● All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.

● This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for all professionals and Hobbyists alike.)

● BBC, B+ and Master compatible.

ONLY **£16** (carr £2)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.50**
● Spare Rack	**£1.50**

ROM Cartridges for the BBC Master
Twin **£8;** Quad **£12**

16K DISC RAM

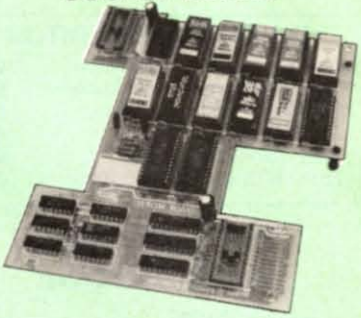
Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.
Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances).
- Read protection (allows recovery from ROM crashes).
- Compact construction.
- Supplied complete with Battery Backup.
- Multiple units may be fitted, even with a ROM board.
- No overheating or overloading problems.
- Free utilities disc supplied.
- Can be used as a 16K PRINTER BUFFER.
- Ideal for professional software development.
- Supplied with utilities software disc.

Only: **£35** (carr £2)

P.S. 16K Disc Ram Board is not designed to work in conjunction with a Sideways ROM Board.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



In the May 1986 Micro User's independent review, the writer concludes, "The board has been well laid out. Its position is much better than others – not over the HOT RAM chips and further away from the disc controller area". "I give the solderless ROM board the thumbs up and wish it success".

This brand new board from Watford Electronics is designed specifically for those wishing to add a ROM board to their own BBC without the need to perform any soldering.

This new board expands the total possible number of ROMs in a BBC from 4 to 16.

Unlike our competitors inferior boards, the ONLY upgrade required for fitting battery backup to the Watford Solderless ROM board (all Watford ROM boards, actually) is the fitting of the battery itself. (No other expensive components are required.)

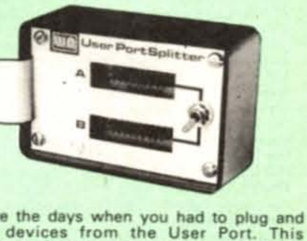
- The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £32
Battery backup fitted **£36**
Battery Backup only **£3**
(carriage £2)

● Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

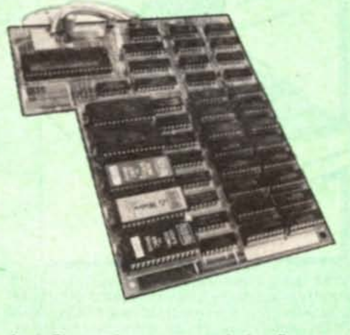
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaniously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination.

Excellent Value at **£22** (carr £2)

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 3 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO overheating problems.
- No User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Firm mounting in BBC micro.
- Compatible with all BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of Battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- Accepts any ROM.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE Fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROM-SPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

Please write in for further details.

INTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM ***£48***
- ROM/RAM card with 64k dynamic RAM ***£65***
- ROM/RAM card with a massive 128k dynamic RAM **£109**

(carriage on ROM-RAM Card £3)

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£17**
- 16k Dynamic RAM for Upgrade **£17.50**
- Battery backup **£3**
- Read and Write protect switches .... **£2** each

Complete ROM-RAM board
All options installed **£115**

P.S.
Is your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford ROM/RAM Board and pay £5 less

Le Modem

The MODEM from Watford

At last a professional MODEM for the BBC Micro. Unlike other 'Modem packages' this is a complete package there are no extra software costs to get 'up and running'. Of course Le MODEM is multi-standard, i.e. 300/300, 1200/75 & 75/1200 UK and BELL (USA) are all supported.

The features that make Le MODEM such good value are:

- *A complete communications terminal that transforms your BBC Micro into a very powerful World-wide data transfer system.*
- *Auto Dials, Auto answers, and is completely controlled by your micro. There are no external controls!*
- *Allows you to access PRESTEL, B.T. GOLD, THE SOURCE, MICROLINK, MICRONET, MICROWEB, THE TIMES NETWORK, MICRO LIVE (BBC TV database), CITY BB and more.*
- *Designed to be SIMPLE but SOPHISTICATED. To LOGON to a data base all you have to know is its TELEPHONE NUMBER, Le MODEM does the rest.*
- *Supplied with a comprehensive telecomms package in a 16K sideways ROM which includes a FULL PRESTEL terminal allowing TELE-SOFTWARE to be downloaded.*
- *A comprehensive 80 column terminal. This includes XMODEM error checked transfer protocol, to allow error free data transfer anywhere in the world!*
- *FULLY controlled by simple "*COMMANDS allowing you to control it from your own BASIC programs. To get you started we supply a FREE disc of bundled software!*
- *Connects to the 1MHz bus. A *AUDIO ON-OFF command allows you to actually hear the telephone line through your BBC micro loudspeaker.*
- *Completely self contained with internal mains power supply. (Even a free mains plug is fitted!) A *TEST facility gives ON SCREEN indication that Le MODEM is working correctly.*
- *Packaged in such as way that you need nothing else except a BBC Micro to communicate with computers all over the world.*
- ***FREE Registration to MicroLink.***

SPECIAL OFFER

Price: ***£75***
(carr £3)

(Price includes, Le Modem, Software ROM, Cables & Comprehensive Manual)
(Write in for further details)

REPLICA 3

This new improved REPLICA 3 from Clares is a very powerful disc based TAPE to DISC Utility. It now transfers even more programs than ever before. Replica 3 will not work with all programs but then neither will anything else. 30,000 Replicas have been sold to date. It has to be good.

£15 (40 or 80 track)

Acorn's Speech Synthesiser package, complete
Special Offer £18

APOLLO

The NEW Modem from Watford

Following numerous requests from you, our discerning customers for an APPROVED, Low Cost & High Performance modem with Auto Dial & Auto Answer facilities as standard) we bring you the versatile APOLLO Modem. Just compare the features and look at the price (which incidentally includes the cost of the Software, manual and BBC connecting cable). We are sure you will agree that Watford Electronics in their traditional way are giving you a super 'value for money' deal.

Just look at these features:

- V21 for Bulletin boards, Microlink, Telecom Gold, etc.
- V23 for Prestel, Home Banking, and other Viewdata services.
- Reverse V23 allows User run Viewdata service.
- 1200-1200 half duplex for communications.
- XMODEM, HEX and ASCII file transmission.
- Auto Dial of given 'phone number.
- Auto Answer for User's Bulletin Board.
- 80 column terminal with split screen facility.
- Prestel text screen dump.
- Fully BABT approved.
- **FREE Registration to MicroLink.**

The Apollo is attractively finished in matt black. It opens the doors to world communication to both, the Hobbyist and the Professionals alike. With baud rates varying from 300/300 Originate and Answer, 1200/75 and 75/1200 full duplex and 1200/1200 half duplex, virtually all the popular tele-services can be accessed. A comprehensive Comms ROM oversees the use of the APOLLO, providing simple commands for all the software controlled facilities. APOLLO is an ideal modem for both the first time buyer and the seasoned user. Join the Telecommunications Revolution – Buy a Watford APOLLO!

Only: **£82** **(Carr £3)**

Price includes, the Modem, Comm Software Cables & Operating Manual).
(Write in for full specification)

VOLTMACE JOYSTICKS

Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**

ATTACHE CARRYING CASE

For the BBC Micro. Attractively finished in antique brown leatherette. Lockable.

Only **£10** (£2 carr.)

Versatile **BEEB SPEECH SYNTHESISER** Unit

Beeb Speech Synthesiser

The Watford Speech Synthesiser is a very flexible speech synthesis unit based upon the powerful phonemes system. This system stores the building blocks of speech (called phonemes) and allows you to combine them quickly and easily to form virtually any word imaginable.

Supplied with an advanced ROM, you are provided with a 500 word dictionary to get you started. These can easily be added to by following the notes given in the comprehensive manual.

SPECIAL PRICE £32 (carr £2)

Continued →

COMPUTER CONCEPT'S ROMS

ACCELERATOR	£30
CARETAKER Basic Utility	£23
DISC DOCTOR	£28
Graphics ROM	£29
TERMI	£25
COMMUNICATOR	£49
Printmaster	£24

Wordwise £23

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear text-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc Interface in your Micro)

HI-WORDWISE-PLUS DISC: £5

SPELL MASTER £42

Inter SHEET ONLY £37

INTER CHART ONLY: £25

Inter-WORD £36

MEGA-3 ROM

Interword, Intersheet & Interchart – 3 in one ROM £76

INTERBASE £49

All Prices Exclusive of VAT

VIEW

VIEW WORDPROCESSOR 2.1	£35
VIEW 3.0 ROM	£48
VIEW PROFESSIONAL	£59
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Watford's own Sophisticated VIEW PRINTER DRIVERS

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MINI OFFICE II

DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.50
ROM Version	£43.00

(When ordering please specify for which Micro & 40 or 80 track Disc).

EPSON NLQ ROM
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
AB
RS

Harness the full potential of your Epson RX or FX printer. The NLQ ROM makes Epson printers produce Near Letter Quality output with optional proportional spacing, enlarged and underlined. Accessed by simple * commands from Basic, Wordwise and View (with driver) or almost any other language.

(Send an SAE for sample printout)

Only: £25

VIEW PRINTER DRIVER for NLQ ROM £7

VIEW PRINTER DRIVER ROM

View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing only at a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redefinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute * command when printing.

Other features include a very powerful on screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips. (Write in for a detailed leaflet).

Price: Only £33

ROM-SPELL

ROMSPELL
ENGLISH DICTIONARY

Probably the most advanced and fastest spelling checker available for the BBC Micro. Compatible with View, Wordwise and Wordwise Plus ROMSPELL is simple to use with easy editing of incorrect words. Full facilities for editing the user dictionary to allow customisation to your personal needs. Dictionary includes over 30,000 words and is supplied with a Comprehensive manual.

NOT compatible with 1770 DFS.
(Please state 40 or 80 track disc)

Price still only: £25

DUMPOUT 3

A highly sophisticated screen dump ROM. This has to be the most flexible and powerful screen dump ROM yet produced for the BBC micro. It will put on paper anything you see on the screen, including full Mode 7 graphics.
Also provided are window setting utilities and OSWORD calls to plot and read Mode 7 graphics pixels.

Facilities:

- Vertical and horizontal scaling in all graphics modes and mode 7
- Rotation of image by 90, 180 or 270 degrees
- Left hand margin setting
- Screen dump window setting
- Colours appear as grey scale
- Two tone fast dump
- Colour mask
- Mode 7 contrast expansion
- Mode 7 contiguous dump
- Key triggered and User Port triggered dumps

The Micro User Feb. 1985.
'Without reservation I wholeheartedly recommend the Dump Out 3 ROM as the ultimate screen dump facility for the BBC Micro . . . it must represent excellent value for money and surely cannot be beaten".

For use with the following printers:

GLP, GP80/100/250, CANNON, STAR, KAGA/TAXAN, NEC, SHINWA CP80, GEMINI, EPSON MX/RX/FX, M1009, NEC PC8023, DMP100/200/400, Panasonic KX1081/82, Mannesman Tally and compatibles.

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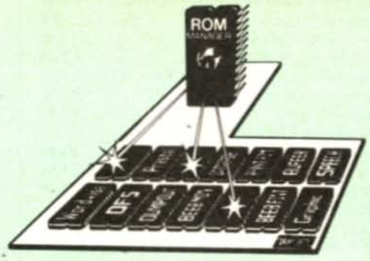

Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs. Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
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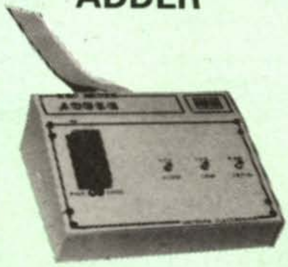

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Adder is the ultimate EPROM programmer for the BBC Micro. It will program many different EPROMs up to the very latest 27256 32K devices.
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£75 (£3 Carr)

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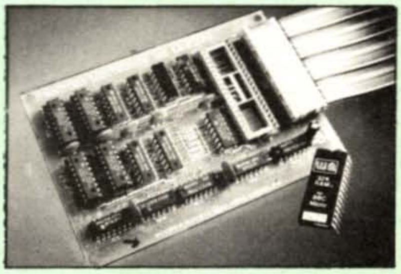
32K
SHADOW RAM-Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16K or even 20K, but a massive 32K of extra RAM!!!

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● "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.

● In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24K of text in memory. This product is recommended as an ideal complement by Computer Concepts.

● Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20K of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28K of program space.

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● Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

● Recommended by Computer Concepts for use with their Inter series of ROMs.

Only £59 (carr £2)

(Price includes a comprehensive manual and the ROM)

INCREDIBLE WORDPROCESSING DEAL

Watford's 32K SHADOW RAM CARD and Computer Concept's INTERWORD Wordprocessor package.

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Continued ⟶

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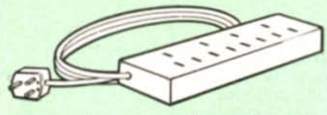

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Continued →

If you thought £150 didn't buy much of a modem you haven't heard about the aries 1200

NEW

Aries 1200 MODEM

APPROVED for connection to telecommunication systems specified in the instructions for use subject to the conditions set out in them.

Up till now buying a modem was a compromise between price and performance, but the new Aries 1200 offers performance and features not found on modems costing two or three times as much. Look at the features offered by the Aries 1200, features which you wouldn't expect from a modem at this price – and some which you would be lucky to find on a modem at any price.

- Operates in V21 (300/300), V23 (1200/75 and 75/1200) and proprietary V23 1200 mode.
- Connect it to any type of computer or terminal via the 25 way serial D connector or the BBC standard 5 pin Domino socket.
- A built in phone socket means your phone plugs straight through.
- A reset switch so the hardware makes it easy to restart – even when your software doesn't.
- Industry standard Hayes (C) compatibility means that this is one of the easiest modems to use. It can automatically work out the speed your computer is working at, and even the speed and protocol of the modem at the other end.
- Auto Call mode can dial using tone or pulse (the modem works that out too), and when it connects it will automatically determine the speed of the answering modem.
- Auto answer mode means the modem can be left unattended to answer calls from other modems, and of course it automatically works out the speed and protocol of the calling modem.
- The built in speaker and front panel LED's mean that you always know what the modem is doing.

Features at any price.

- Proprietary V23 mode mean that two Aries 1200's can communicate at 1200/1200 and in this situation you can take advantage of the built in data compaction which reduces the volume of text you send by 30%.
- Built in scrambler means that data transferred between two Aries modems is automatically encrypted. The encryption code can be user defined for a totally private email system.
- User defined control commands means that the Aries can even be used from a dumb terminal or with non standard software.
- Front panel light include indicators for Power, Auto Answer Mode, Transmit, Receive, On line, Terminal ready and Carrier Detect. There's even an indicator to show the quality of the phone line.
- Internal watch-dog monitors the modems activity and in the event of a power failure or computer crash it automatically resets the modem. The Aries modem can never hold open your phone line or lock up your computer.
- Built in printer port allows the Aries to direct incoming data directly to a printer, text can be tagged so that it is selectively sent either to the printer or the computer.
- All modem setting are stored in solid state non volatile memory – no battery to go flat and hang crash the system.

Launch Offer **Only: £149**

Hayes Compatible BBC Comms Software ROM & Manual **£25**

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"MIGHTIER THAN THE QUILL"

The WAPPING EDITOR

Watford Electronics bring professional quality Desktop Publishing to the Beeb. The Wapping Editor is a totally self contained mouse-driven desktop publishing package designed to run on the BBC B, B+ and Master computers. The massive 64K Rom contains ALL the software you need to do your own publishing. It 'Brings the Freedom of Press' to your fingertip. The software has a word processor, a graphics package, a page layout section and a font designer. Although very sophisticated, Wapping Editor is simplicity itself to use. Anyone already familiar with Quest Paint will immediately feel at home.

GRAPHICS PACKAGE

Imagine Quest Paint re-written to take advantage of the high resolution of Mode 0, well this is it. The Wapping Editor could well be worth buying for this facility alone. This must surely be the graphics.

WORD PROCESSOR

This section is a fully functional word processor specially tailored to suit the Desktop Publishing environment. Gone are all the unnecessary and cumbersome text formatting commands – these are dealt with in the 'Page-Layout' section. The features of this word processor include wordwrap, wordcount, insert/overwrite, move block, copy block, delete block, search and replace, browse, etc, many of these features being mouse controlled. Text input can of course be taken from existing word processor files like Wordwise, View, etc, but it is not necessary to have a separate word processor in order to use this package.

PAGE-LAYOUT SECTION

Page Layout becomes easy using these mouse-driven routines. The user simply 'pulls' a rectangle onto the page and states which text document or graphic is required to fill the space – it's as simple as that! Text can be automatically printed in a pre-set number of columns, left justified and/or right justified, or centered. Several different typefaces can be held in memory at one time. Graphics may be stretched, squahsed or cropped to fit any size rectangle. Graphics input can be from the software provided in the package or, using the 'mode convert', from any graphics mode screen.

THE FONT EDITOR

This is an enhanced version of the font editor contained in the Con-Quest ROM and allows the editing of ALL 95 characters. As well as being able to design your own typefaces, fonts from other DTP packages or from Quest Pain may be loaded into the editor and converted for use with the Wapping Editor. This sophisticated editor has numerous functions including slide, flip, invert and rotate individual characters or the whole font. Individual characters can be mirrored or copied and a mask feature allows you to superimpose two characters. Lines and columns can be inserted or deleted allowing the character to be stretched or squashed. This font editor will also allow 'font' and 'brush' files to be designed for use with Quest Paint.
This package is the latest in the line of integrated professional quality mouse-driven software from Watford Electronics, the company that adds power to Beeb.

Launch Offer: **£69**

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THE ART OF THE BEEB

Mike Gerrard puts us in the picture

WE hear a lot about the terrific graphics capabilities of recent computers like the Archimedes, yet the good old BBC Micro is the machine on which a new generation of computer graphics artists begin their training in a course being run at the City of London Polytechnic. The results show that the BBC Micro – in the right hands – can still produce work of stunning originality.

The part-time diploma course in art and design studies attracts students ranging in age from their teens to their forties, from both technical and artistic backgrounds. Course tutor is Dr. Mike King, a research Fellow in Computer Art and Animation, whose own interests in computers began when he bought a BBC Micro about four years ago.

"I bought the BBC Micro because it was easily the best machine available at the time. I used it initially for word processing but I used to paint and was naturally interested in what you could do on a micro", he said.

Mike King was a physics teacher but left in order to pursue his own studies in this cross-breed world of art and science. Having initially obtained a Masters degree at Oxford in software engineering, he went to the Royal College of Art to take his PhD in user interfaces to computer graphics in the visual arts. His work at the City of London Polytechnic began about two years ago, so this summer will see the first diploma students emerging from his course.

"I didn't specifically choose the BBC Micro for the course", he said. "I simply inherited them because they were here. They are very good for new students to work on, and it helped that I was familiar with them from my own work at home".

Mike King believes that it's important for students to learn to program for themselves rather than rely totally on commercial graphics software, though this is also used. The course aims to prepare students for what they will meet in the outside world, and this is reflected in the choice of Pascal as the programming language.

He explained: "The way I approach teaching is to concentrate very much on the graphics side and then explain how to get the effects you want. For example, I might begin with a very simple shape repeated in a regular pattern across the screen. Once I've explained how to generate the shape, I then show how to repeat it at regular intervals both straight across and straight down the display. "After that I would move on to an image that's dropped slightly so that you get more of a diagonal pattern, and this then gives me chance to introduce IF..THEN..ELSE".

I asked student Andrew Jenkel why he was on the course and what he was getting from it: "I work for a car design company where they are interested in computer aided design, but I wanted to come here to learn as much as possible about all aspects of computer graphics.

"The trouble with getting a CAD system is that you know whoever you get it from will give you a quick training course and tell you at the end of the week that that's it – you've learnt everything you need to know about this system. That's obviously impossible, so I wanted to learn much more and the course does cover computer aided design.

"One great thing about computer graphics is the experimentation that you can do. It is very easy to change the colours in a piece of work and see how you get a totally different effect. You learn about the relationship of colours to each other – background and foreground – and you can get different effects just by changing one line of your program. For instance, some combinations give better 3D effects than others.

"I admit that I'm not a very good artist, and I tend to work with a piece of graph paper in front of me, sketch out my ideas on that, and then think about how I can make them work in terms of a program. I might give up on some ideas because I know it's beyond my ability to program them yet, but others make me determined to find out how to get the effects I want, and that's a great way to learn to program".

Meanwhile the course continues, with another intake of students due in the autumn, when Mike King also hopes to run an evening course which will introduce artists working in other media to the possibilities of the BBC Micro.

> *"It's important for students to learn to program for themselves rather than to rely totally on commercial graphics software"*

PROGRAM Library No.23

Compiled by Steve Turnbull

THIS month we have a simple date stamp routine to make it easier to keep track of when your files were created, a skeleton program for any application that's simple to use and add to, and yet another text scrolling program, this time the path being defined by a mathematical formula.

Title: Menu System
Language: Basic
Author: Teri Paul

Writing a menu is a chore that needs to be done for almost every application program. The process is made worse when you suddenly decide to add an option – you have to change the menu print routine, alter variable values and generally make the whole program messy.

The set of routines shown here make generous use of the EVAL command to make this task ridiculously easy. In all programs you have an initialisation phase followed by processing and finally quitting. The idea is that the program skeleton knows nothing about what options are available and what they do, but by just reading from DATA statements it can select and call four different routines for each option.

During initialisation it calls a routine for each choice called:

```
DEF FNinitXXXX
```

When printing the menu on the screen each routine must place its name into variable *n$* when called via:

```
DEF FNnameXXXX
```

The actual function that performs the operations of the option is:

```
DEF FNdoXXXX
```

And finally there's the termination routine for each:

```
DEF FNquitXXXX
```

Not every routine will do anything useful, but they must all exist because the main program will call *init*, *name*, *do* and *quit* routines for every option.

To add a new menu choice all you do is add its name to the DATA statement at line 150. Then put in the four routines – even if they're not needed.

```
   10 REM Menu System
   20 REM by Teri Paul
   30 MODE7:PROCinit
   40 ON ERROR PROCerror
   50 REPEAT PROCmenu
   60 PROCdoOpt("do",option)
   70 UNTIL quit:PROCquit:END
   80 DEF PROCinit:*FX4,1
   90 quit=FALSE:READ NumOpt
  100 DIM opt$(NumOpt)
  110 FOR O%=1 TO NumOpt
  120 READ opt$(O%):NEXT
  130 PROCscanOptions("init")
  140 PROCcoff:ENDPROC
  150 DATA 5,Load,Save,Edit,New,Quit
  160 DEF PROCcoff
  170 VDU23,1,0;0;0;0;0;:ENDPROC
  180 DEF PROCscanOptions(x$)
  190 LOCAL O%:FOR O%=1 TO NumOpt
  200 PROCdoOpt(x$,O%):NEXT:ENDPROC
  210 DEF PROCdoOpt(x$,O%):LOCAL Z%
  220 Z%=EVAL("FN"+x$+opt$(O%)):ENDPROC
  230 DEF PROCerror
  240 IF ERR=17 ENDPROC
  250 ON ERROR OFF:PROCquit
  260 REPORT:PRINT" at ";ERL:END
  270 DEF PROCquit:CLS:*FX4
  280 PROCscanOptions("quit")
  290 PROCcon:ENDPROC
  300 DEF PROCcon
  310 VDU23,1,1;0;0;0;0;:ENDPROC
  320 DEF PROCmenu:CLS
  330 LOCAL B%,X%,Y%,n$:X%=10:Y%=6
  340 FOR O%=1 TO NumOpt
  350 PROCdoOpt("name",O%)
  360 PRINTTAB(X%+1,Y%+O%)n$
  370 NEXT:B%=1
  380 REPEAT VDU 31,X%,Y%+B%,ASC">"
  390 REPEAT Z%=GET:UNTIL Z%=32 OR Z%=13
  400 VDU 31,X%,Y%+B%,32
  410 IF Z%=32 B%=B%MODNumOpt+1
  420 UNTIL Z%=13:option=B%:ENDPROC
  430 DEF FNinitLoad=0
  440 DEF FNinitSave=0
  450 DEF FNinitEdit=0
  460 DEF FNinitNew=0
  470 DEF FNinitQuit=0
  480 DEF FNnameLoad:n$="Load data":=0
  490 DEF FNnameSave:n$="Save data":=0
  500 DEF FNnameEdit:n$="Edit data":=0
  510 DEF FNnameNew:n$="New data":=0
  520 DEF FNnameQuit:n$="Finish":=0
  530 DEF FNdoLoad=0
  540 DEF FNdoSave=0
  550 DEF FNdoEdit=0
  560 DEF FNdoNew=0
  570 DEF FNdoQuit:quit=TRUE:=0
  580 DEF FNquitLoad=0
  590 DEF FNquitSave=0
  600 DEF FNquitEdit=0
  610 DEF FNquitNew=0
  620 DEF FNquitQuit=0
```

Get it right!

```
 10 =    0 0 | 220 = 68FB 5 | 430 = EABB 0
 20 =    0 0 | 230 = 72B4 2 | 440 = 872E 6
 30 = 916A A | 240 =  E65 E | 450 = 8806 9
 40 = 9621 B | 250 = 561A 5 | 460 = 5E20 C
 50 =  E3A E | 260 =  532 8 | 470 = 3A28 A
 60 = EE91 0 | 270 = AF04 7 | 480 = 91BF 8
 70 = 9461 8 | 280 = D68A 2 | 490 = 9993 4
 80 = F859 A | 290 = E7F5 1 | 500 = E87B 2
 90 = EA88 9 | 300 = C421 7 | 510 = F321 7
100 = 8225 A | 310 = E3CF 3 | 520 = 34D9 3
110 = AF12 3 | 320 = AA5D A | 530 = 85C9 A
120 = 3E82 1 | 330 =  BDF 3 | 540 = E85C 4
130 = 29E9 0 | 340 = AF12 E | 550 = E774 F
140 = F277 B | 350 = D39C 4 | 560 = 6F69 6
150 = A347 3 | 360 = 1635 0 | 570 = 7996 1
160 = 3D01 9 | 370 = 3442 3 | 580 = 6323 1
170 = E0BA 5 | 380 = 93BF E | 590 =  EB6 6
180 = 68D5 C | 390 = EAF0 B | 600 =  19E D
190 = B9F8 6 | 400 = B44A 4 | 610 = CF3A 4
200 = 9D15 6 | 410 = 89E5 3 | 620 = B3B0 9
210 = A612 7 | 420 = 7458 D |
```

Title: Super-scroll
Language: 6502
Author: William Frisby

For some reason text scrollers are very popular, and here's one that's different again from any we've had before.

Although it only works in Mode 7 it allows the route of the text to be defined by a mathematical formula and prints the letters eight characters high, pushing them across the screen from right to left.

The program uses a parabolic function in line 100 so the text rises from the bottom right, pushes rapidly up, flattens out and finally drops down to the left. The formula shown at line 90 is linear and rises to the left, the one at line 80 also goes up at the left but in a curve and the one at line 70 describes a fairly sharp sine wave. Any of these can be used to replace line 100.

Direct screen addressing is used, so care must be taken to ensure that the value of *Y%* does not go out of the range 0 to 14. The program is quite fast as it stands, but if you really need to you can remove line 490 which synchronises the display with the screen blanking.

```
   10 REM Super-scroll
   20 REM by William Frisby
   30 MODE 7:DIM addr% 80
   40 VDU30:FORY%=0TO24:VDU150,8,10:NEXT
   50 VDU 30,23;8202;0;0;0;
   60 FOR X%=0 TO 39
   70 REMY%=10+SINRAD(X%*10)*8
   80 REMY%=2+ATNRAD(X%*10)*10
   90 REMY%=2+X%/3
  100 Y%=2+(X%-20)^2/24
  110 A%=&7C00+Y%*40+X%
  120 addr%!(X%*2)=A%:NEXT
  130 PROCassemble
  140 T$="...This is a demo of scroll
ing text following a defined path..."
  150 L%=LENT$:P%=1
  160 REPEAT A%=ASCMID$(T$,P%)
  170 CALL char%:P%=P%MODL%+1:UNTIL0
  180 DEF PROCassemble
  190 FOR pass%=0 TO 2 STEP 2
  200 P%=&A00:[OPT pass%
  210 .scroll% LDX #1
  220 .loop1% TXA:ASL A:TAY
  230  LDA addr%,Y:STA &72
  240  LDA addr%+1,Y:STA &73
  250  LDA addr%+2,Y:STA &70
  260  LDA addr%+3,Y:STA &71
  270  TXA:PHA:LDX #8:LDY #0
  280 .loop2% LDA (&70),Y:STA (&72),Y
  290  CLC:LDA &70:ADC #40:STA &70
  300  LDA &71:ADC #0:STA &71
  310  CLC:LDA &72:ADC #40:STA &72
  320  LDA &73:ADC #0:STA &73
  330  DEX:BNE loop2%:PLA:TAX:INX
  340  CPX #39:BNE loop1%:RTS
  350 .char% STA mem%:LDA #10
  360  LDX #mem%MOD256
  370  LDY #mem%DIV256:JSR &FFF1
  380  LDA #128:STA mask%
  390 .loop3%:LDX #1:LDY #0
  400  LDA #A%MOD256:STA &72
  410  LDA #A%DIV256:STA &73
  420 .loop4% LDA mem%,X:AND mask%
  430  BEQ space%:LDA #255
  440 .cont% STA (&72),Y:CLC
  450  LDA &72:ADC #40:STA &72
  460  LDA &73:ADC #0:STA &73
  470  INX:CPX #9:BNE loop4%
  480  JSR scroll%
  490  LDA #19:JSR &FFF4
  500  CLC:LDA mask%:ROR A:STA mask%
  510  BNE loop3%:RTS
  520 .space% LDA #0:JMP cont%
  530 .mask% BRK
  540 .mem%:]:NEXT:ENDPROC
```

Get it right!

```
 10 =    0 0 |                | 
 20 =    0 0 |                | 
 30 = 9576 6 |                | 
 40 = 9FA0 F | 210 = 88DD 0 | 380 = ADF9 A
 50 = 70EA 3 | 220 = 203F C | 390 = 90D2 D
 60 = A12B 2 | 230 =  C9A 3 | 400 = EFFF 7
 70 =    0 2 | 240 = 1D5A 9 | 410 = F934 B
 80 =    0 2 | 250 = 55C3 A | 420 = 7CCE A
 90 =    0 2 | 260 = 9DAB 1 | 430 = 88CE 2
100 = 97E0 9 | 270 = 5378 7 | 440 = 401D A
110 = 9378 7 | 280 = C985 9 | 450 = 5D3D 0
120 = F057 0 | 290 = E210 9 | 460 = 99B3 5
130 = 126A 6 | 300 = F998 1 | 470 = 2DDA 1
140 = 2AB7 2 | 310 = E396 7 | 480 = 6D2B 3
150 = 26BE 3 | 320 = 99B3 6 | 490 = 5366 F
160 = 6326 5 | 330 = C559 B | 500 = 3869 3
170 = 7BCE 1 | 340 = 854B F | 510 = 708A 0
180 = 98A5 E | 350 = 3C6B 3 | 520 = 57E3 1
190 = F87C D | 360 = EE6D 0 | 530 = 52CF 5
200 = 2B5F 0 | 370 = 84A2 2 | 540 = 45FD 1
```

Title: Date Stamp
Language: 6502
Author: Bruce Goatly

No matter how carefully you choose names for your word processor files you are likely to come up against the problem of finding a file with a particular date. To save you from the chore of loading files and reading them, this short utility lets you date stamp a text or data file so the date is recorded in the load and execution addresses, which for such files are normally redundant.

It will work whether or not your computer has a real-time clock and can also be used on Basic programs.

Type the program in then save it. When run it generates and saves the machine code routine, which can then be used as the command:

```
*DATE <filename> <date>
```

The filename may include a full file specification and the date is expressed as six digits. For the date, use DDMMYY or MMDDYY as you prefer, but as error checking is minimal be sure to use six digits. The date is revealed by the *INFO or *EX commands.

```
   10 REM Date-stamper
   20 REM by Bruce Goatly
   30 PROCassem
   40 PROCsave
   50 END
   60 DEF PROCassem
   70 params=&70
   80 temp=&82
   90 FOR L%=0 TO 2 STEP 2
  100 P%=&A00:[OPT L%
  110  TYA:CLC:ADC &F2:STA params
  120  LDA &F3:ADC #0:STA params+1
  130  LDY #0
  140 .loop LDA (params),Y
  150  CMP #32:BEQ out:INY:BNE loop
  160 .out
  170  LDA #13:STA (params),Y
  180  LDA #5:STY temp:JSR rwcat
  190  BEQ nofile:LDY temp:INY
  200 .loop1 LDA (params),Y
  210  CMP #32:BNE out1
  220  INY:BNE loop1
  230 .out1
  240  JSR convert:STA params+3
  250  JSR convert:STA params+2
  260  LDA #&19:STA params+7
  270  JSR convert:STA params+6
  280  LDA #1:JSR rwcat:RTS
  290 .nofile
  300  OPT FNerror(66,"No such file
")
  310 .rwcat LDX #params
  320  LDY #0:JMP &FFDD
  330 .convert
  340  LDA (params),Y
  350  ASL A:ASL A:ASL A:ASL A
  360  STA temp:INY:LDA (params),Y
  370  SEC:SBC #48
  380  ORA temp:INY:RTS
  390 ]:NEXT:ENDPROC
  410 DEF FNerror(E%,e$)
  420 [OPT L%:BRK
  430  OPT FNb(66):OPT FNs(e$)
  440  BRK:]:=L%
  460 DEF FNb(B%)
  470 ?P%=B%:P%=P%+1:=L%
  490 DEF FNs(s$)
  500 $P%=s$:P%=P%+LENs$:=L%
  520 DEF PROCsave
  530 *SAVE DATE A00 A71
  540 ENDPROC
```

Get it right!

```
 10 =    0 0 |                | 
 20 =    0 0 |                | 
 30 = B854 4 | 190 = 6D95 C | 350 = 8C08 0
 40 = 90DB 2 | 200 = 9BB9 B | 360 = 8508 F
 50 = FD2E D | 210 = F3D2 9 | 370 = C668 6
 60 = B623 6 | 220 = 6DCC 8 | 380 = 9E58 2
 70 = 9101 D | 230 = 9B37 1 | 390 = 953B 2
 80 = C225 9 | 240 = 41E4 6 | 410 = 52A7 F
 90 = AAB9 5 | 250 = 51C5 1 | 420 = A502 B
100 = 6608 7 | 260 = 1B34 C | 430 = BCEF 5
110 = 4AF2 1 | 270 = 1141 9 | 440 = 29A9 A
120 =  AD0 6 | 280 = 62E9 0 | 460 = 39B9 A
130 = 9CF1 D | 290 = F615 A | 470 =  8D5 5
140 = EEBA D | 300 = EBEF A | 490 = 5616 8
150 = 4E42 4 | 310 = 2B34 8 | 500 = CB3B E
160 = EBF1 9 | 320 = 74D7 8 | 520 =  EB7 1
170 = 8BA2 B | 330 = 87D1 E | 530 =   A7 F
180 = 8DEF 7 | 340 = 8B80 7 | 540 = ED0F 3
```

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Your technical questions answered by MIKE COOK

PROBLEM SOLVED

Across the pond

MY system consists of a BBC Master 512, Epson RX80, disc drive and monitor and I run them off a single plug using a six-way connector. I am moving to Oklahoma and would appreciate your advice on the most efficient way to transform their power source – 110V, 60Hz – to one switchable for my system. – **Ciaran O'Hare, Taunton, Somerset**

● *Most large electrical shops will sell a step-up transformer to convert the lower mains voltage to the UK standard. The frequency will not be changed but this will not make any difference to your setup. Make sure that the transformer is rated correctly to handle the current, which in your case will not exceed five amps.*

Random errors

I HAVE a Watford Mark 2 DDFS in my BBC B and have recently written a database program which uses random access to handle the records. My problem is that a CRC error is reported every now and again. There seems to be no pattern and it doesn't happen in the same place every time.

The error corrupts a track on the disc right in the middle of the file and the bad track shows up when I verify the disc and the file is unreadable past this point. I do not have a clue what's causing the error or how to fix it. Please can you help? – **L. Noar, Swinton, Manchester**

● *The problem is probably with the disc drive speed: The micro is not finding quite the right place on the track to re-write the new sector. As a result the new sector spills over into the next one and corrupts it, hence the CRC error. The micro finds a sector by a specific delay from the index hole passing a certain point. If it is not running at the right speed this will be at the wrong point.*

As your system works correctly most of the time the drive must be running at the correct speed then, but when using random access files the disc will not have been spinning for as long as normal operation when access occurs. So it seems to me that your drive is not getting up to speed quickly enough. This could be due to cheap discs having a slightly higher friction drag, or a slipping belt on your drive.

Alternatively it could be caused by running your drive from the power supply in the micro rather than a separate one, as the surge from the drives when they are turned on often causes the supply voltage to sag slightly resulting in the motor being slow to reach full speed. Finally, the speed of your drive could be such that it is on the very limit, so you could try adjusting it to make it go slightly faster. This can normally be achieved by a potentiometer on the drive electronics board, and the strobe lines on the motor can be used – viewed under a fluorescent lamp – to set the speed correctly.

Ram amnesia

I HAVE a problem with my Watford solderless rom/ram board: I can load a rom image into the battery-backed sideways ram and it will work. But when I turn the micro off, and later back on, the rom image is still there according to the *HELP message but it will not work – the machine crashes when the image is called. The battery backup for the ram is fully charged and it seems to be supplying the two 6264 chips.

Could you please help? – **R.J. Smallshire, Cradley Heath, West Midlands**

● *As the rom image is stored in two static rams it appears that one is not retaining its contents when switched off. The first contains the headers and appears to be working but the second one is not. Assuming they are plugged in correctly, first of all try swapping them. If the image appears to disappear using the *HELP command the ram is faulty.*

However, if the result is no different then I suspect that the board is in error and the backup supply voltage is not reaching the second ram.

Accurate shooting

PLEASE could you tell me if it is possible to connect an Atari-type nine pin joystick to the analogue joystick port, as I require a more accurate controller for games? – **Pak Charoenkul, Chelsea**

● *Most nine pin Atari-type joysticks are of the switched type – rather than analogue – therefore I am puzzled as to why you think this would give*

Turn to Page 120 ▶

On the agenda...

- **Transforming a BBC Micro to work abroad**
- **Curing disc errors in random access files**
- **Making sideways ram hold its memory**
- **Connecting alien joysticks**
- **Using an Electron with a BBC Micro**
- **Obtaining composite colour from Compacts**
- **Modem compatibility with software**
- **Matching disc drives and filing systems**
- **Superior tape loading problems**
- **Finding the link on old BBC Micros**

◀ From Page 119

you more accurate control. Nevertheless if you want to attach a switched joystick of this type to the BBC Micro you can buy Body Build Pack 20 – February 1985 – priced £10 kit or £12 assembled from Musbury Consultants.

This was designed to interface the Atari track ball in joystick mode and needs a slight modification to be used with a joystick, but this will be done free if you request it with your order.

New disc drive

I BOUGHT a disc drive from Watford Electronics along with its MkII DDFS two years ago. I now want to buy a new disc drive. Is the MkII DDFS compatible with any disc drive? – **A. Light, Holmwood, Dorking**

● *Any disc drive that's suitable for a BBC Micro is compatible with the Watford DDFS, or for that matter with any disc filing system.*

Game troubles

I RECENTLY bought the games Spycat, Barbarian and Thrust, and none of them have loaded on my BBC Micro. I have written to Superior several times and they have given me lots of different copies but to no avail. I have a friend who also has a BBC Micro and they all work on that without a hitch.

I have tried adjusting the volume but that doesn't work and all of my other games load perfectly. Can you help? – **James Woodward, Hertford, Herts**

● *It would seem that Superior is using some form of software protection that is upsetting your system. This could be a recurrence of the serial ULA problem: A small batch of micros were produced with a serial ULA that, while it worked normally in most situations, would not work with some protection systems.*

The cure might be to seek a replacement ULA, but try swapping the one from your friend's micro to make sure before you part with any cash.

Older video

I HAVE an issue 3 BBC B and wish to convert the video output to colour for use on a colour TV. I've heard that I need to make link 39 but I can't see it on the board, or condenser C558 for that matter. Could you please tell me what I connect to where to get a colour video output? – **C. Carter, Marlborough, Wiltshire**

● *Link 39 was not put on the boards until issue 4 so what you have to do is a little more complex. You need to solder a 100pf – not critical –*

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capacitor between the emitter of transistor Q9 and the base of Q7.

Electron extension

I HAVE been given the main circuit board from an Electron. Can I connect it to my BBC B 1.2 OS to either increase accuracy or as a kind of second processor? – **B. Critchley, York**

● *In my opinion there is nothing useful you can do with an Electron board and a BBC Micro – but can a reader prove me wrong?*

Compact video

I BOUGHT a Compact a month ago and although I'm basically satisfied with it, I now want to use it to produce title screens for video films. Although I had anticipated this being a simple modification, in order to produce colour via the Video Out socket – as suggested in the September 1988 issue of *The Micro User* for the Master – I am uncertain as to whether the appropriate link exists and if so where it is. The socket on the video recorder is a standard BNC video in type. – **Stuart Randell, Blackburn**

● *Unfortunately the Compact, unlike the BBC B and the Master, does not have any circuitry to produce a composite colour signal. Therefore to get a colour video signal you will have to feed the RGB signal into a PAL encoder.*

The snag with this is that commercial encoders cost several hundred pounds, and although there are cheaper do-it-yourself circuits using LM1886 and LM1889 chips or the Mullard TEA2000, I have always found the results less than satisfactory with good results on one TV and no colour on others.

Getting on line

I OWN two Telemod 3 modems made by OE Ltd and have just bought the appropriate leads to connect them to a BBC Micro. I now have the problem of what software I can use. Are these modems compatible with BBC Micros, or have I been ripped off? – **D. Arrowsmith, Southwell, Notts.**

● *Most communications software should work with your modems, as it usually just throws data at the serial port and then picks it up again. However some features of some packages require special hardware, like auto dialling and changing standards, so these should be avoided.*

For scrolling Ascii only you'll find Mini Office II from Database Software ideal while if you want to receive viewdata Commstar II from Pace is a good choice.

Have you any hardware problems with your BBC Micro? If so, write to Mike Cook, The Micro User, Europa House, Adlington Park, Adlington, Macclesfield SK10 4NP, giving full details of your system and the problem.

Unfortunately, Mike cannot send you personal replies, but as many questions as possible will be answered on the pages of The Micro User.

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TO ORDER PLEASE USE THE FORM ON PAGE 143

SOFTWARE UPDATE....

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The professional investment analyst and portfolio reporting system £99.95

CONSUMABLES

27C128 16k CMOS EPROMS	£4.20
5.25 Floppy Discs x 10	£6.00
3.5 Floppy Discs x 10	£10.00

REVIEWS...

VU-FAX is a teletext system. It lets you create, edit and display up to 1000 Mode 7 screens in a variety of ways. That's interesting enough in itself, but the pages in Vu-Fax can be cycled through at the rate of around 20 pages a second.

Such speed and capacity is only possible if the system uses ram, and as we're talking about an ordinary BBC (B, B+ or Master) and not Archimedes, how is it done? Simple – with Morley's ram disc.

Operation is simplicity itself and it's transparent in use – apart from an almost magical increase in speed. For example, a 20k Mode 1 screen loads in around 0.2 seconds as opposed to the 3 to 4 seconds it would take from a floppy disc.

MICRO USER

The Morley Teletext Adaptor can capture teletext information and software broadcast by the BBC (Ceefax) and ITV (Oracle) through a standard television aerial and display them on an ordinary TV set. The advantage over teletext by phone is that, once you've bought the hardware, the software comes free and there is no subscription charge.

In terms of price, performance, future expansion possiblities and those little touches that show thought for the end user, I would recommend the Morley unit.

ACORN USER

NO writer of software reviews should be without one – this was my conclusion after only half an hour with this clever add-on. Morley Electronics has added software to a rom cartridge from Care Electronics and come up with a package with no clear rival. The cartridge contains a 16k eprom for the software, and a small ram chip to store the user-defined instructions. There is a miniature push button on the top of the cartridge which activates a previously determined sequence of commands.

MICRO USER

A very wide range of possible uses make this utility live up to its name. A really excellent buy for Master owners.

Meet the Morley Family...

Teletext Adapter

The adapter is housed in a plastic disc drive style case, similar in colour to the BBC micro. It connects to the User Port via a 4-way ribbon cable and can take its power either from the computer or from our optional power supply.

The unit comes with the ATS (advanced teletext software) written for us by the BBC. The HOLD PAGE and REVEAL features are implemented, and pages can be saved to disc under your own file names.

Telesoftware is catalogued and selected from the Menu page, and the programs are easily downloaded.

THIS IS THE BIGGEST SELLING TELETEXT ADAPTER CURRENTLY IN PRODUCTION WORLD-WIDE, AND COMES WITH A FULL MONEY BACK SATISFACTION GUARANTEE.

Adapter BBC/Master	£104.20
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Adapter RML Nimbus	£104.20
Optional Power supply	£8.80
Teletext Utility Disc	£5.20

EPROM Programmer V2

This state-of-the-art unit, allows programming of 2764, 27128 and 27256 EPROMS both 12.5 and 21 volt. Totally under software control it is believed to be one of the fastest programmers available today.

The comprehensive user-friendly software included in the package has two main parts. The first allows EPROMS to be read, programmed, verified, and edited, also allowing a ROM image to be loaded or saved. The second is a full ROM management system in its own right, which has a host of useful features and routines, such as KILL and RESURRECT ROM to disable or enable a sideways ROM, dump ROM image to buffer or disc, move ROM image in buffer to sideways RAM, and VIEW-SEARCH any sideways ROM.

£30.00

Eprom programmer utility disc – Put all your favourite routines into Sideways Rom, both BASIC and M/Code allows multiple programmes up to 16k with separate * commands for initialisation and help.

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Master Board "AA"

At long last the add-on all MASTER users have been waiting for, an internal ROM board.

No more need to turn the computer off to insert the cartridge containing the ROM you need to debug the program in memory.

The all new MORLEY MASTER BOARD "AA" allows you to have up to 8 x 16k and 4 x 32k extra Roms installed inside your MASTER and still leaves the cartridge slots free. This in effect allows your MASTER to support as many as 24, 16k ROMs installed permenantly, with the addition of your standard 4 x sideways ram banks and four banks by using cartridges.

A staggering 32 ROM images installed and accessible at any time.

Included in the package is a utility ROM which has many useful features including a clever file transfer program that transfers files between DFS and ADFS formats or vice versa.

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The Latest Arrival...

The Morley range of Winchester Drives are completely compatible with all BBC's, B+'s and Master computers fitted with ADFS.

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32k non-volatile ram cartridge ideal for Spellmaster dictionary	£33.00

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We now stock a full range of computer concepts software and will gladly populate your 'AA' board or cartridge before despatch.

Master Smart Cartridge

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The Smart Cartridge will at the press of a button halt a program running in memory and execute any one of a host of useful built-in, or user defined procedures, and once completed will return to the program and continue where it left off. The only limiting factor with this device is the programmers imagination.

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*Allows most protected software to be backed-up including tape to disc and disc to tape.

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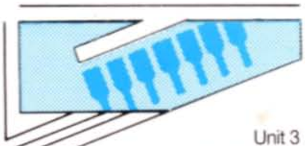

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Patrick Whittaker presents an unusual and challenging game of strategy

A HYDROGEN bomb of awesome power has been detonated on a remote Pacific atol. What was sand is now glass and where there was once life only dust and ash remain. But in one tiny corner, sheltered from the blast by a mighty boulder, something stirs – it's Boris the spider.

Blinded by light a hundred times brighter than the sun and so horribly deformed by radiation poisoning that he looks like an asterix, Boris is ravenous. Fortunately, he is not alone. Four other bugs have survived the blast.

Sensing food, Boris prowls his microscopic kingdom, unable to see and yet still as deadly as ever he was. But the Beasty Bugs are not easy prey. They know in their own beastly way that there is refuge of sorts to be found in four blue squares which have mysteriously appeared in the charred ground.

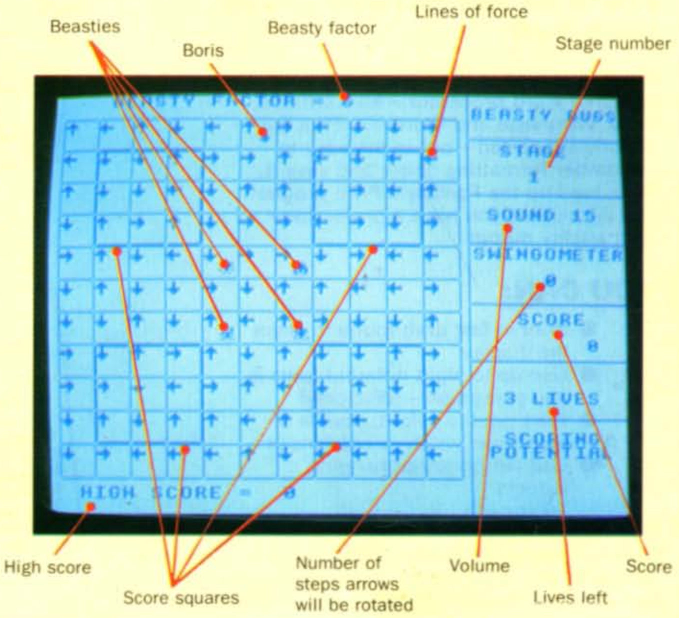
What they don't know is that their lives are being controlled by an unimaginable intelligence whose thought patterns reach across the galaxy. Taking advantage of the energy released by the bomb, this Galactic Game Player has altered the laws of physics that affect the Beasties. Bored by 10 million years of existence, he has created a game to while away the odd century or two.

For him, it is a game. For Boris and the Beasty Bugs, it is a matter of life and death.

Rules of the game

- *The Beasties move according to lines of force – little blue arrows.*
- *Each Beasty is filled with energy that gradually increases to a maximum then falls to a level just capable of supporting movement.*
- *The Beasties move according to the Beasty Factor – a measurement of the energy with which they have been charged.*
- *The number of steps taken is equal to the Beasty Factor – between one and six.*
- *The Beasty Factor does not affect Boris: He has total freedom of movement and his only limitation is his blindness.*

The Galactic Control Panel


Beasties
Boris
Beasty factor
Lines of force
Stage number
BEASTY FACTOR = 0
BEASTY BUGS
STAGE
1
SOUND 15
SWINGOMETER
0
SCORE
0
3 LIVES
SCORING POTENTIAL
HIGH SCORE = 0
High score
Score squares
Number of steps arrows will be rotated
Volume
Lives left
Score

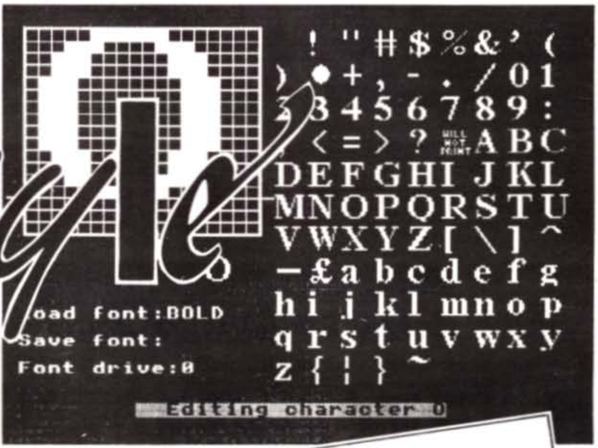
THE CONTROLS

Spacebar	*Increments the number of steps the arrows – lines of force – will rotate. At 3 it loops back to 0*
Return	*Rotates the arrows and sets the Beasties moving*
@	*Claims – where permissible – the available points*
Tab	*Increments the sound level. At 15 it 'oops back to 0*

Turn to Page 127 ▶

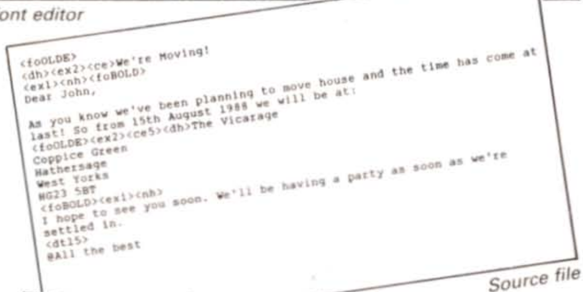
Print in style on your micro with

FontStyle



```
oad font:BOLD
Save font:
Font drive:0
        Editing character 0
```

Font editor

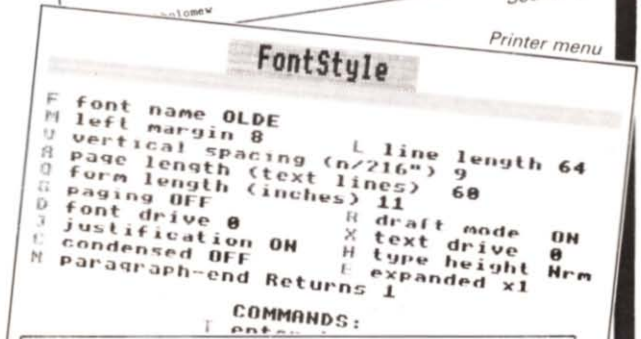


```
<foOLDE>
<dh><ex2><ce>We're Moving!
<ex1><nh><foBOLD>
Dear John,

As you know we've been planning to move house and the time has come at
last! So from 15th August 1988 we will be at:
<foOLDE><ex2><ce5><dh>The Vicarage
Coppice Green
Hathersage
West Yorks
HG23 5BT
<foBOLD><ex1><nh>
I hope to see you soon. We'll be having a party as soon as we're
settled in.
<dt15>
@All the best
```

Source file

Printer menu



```
                  FontStyle
F font name OLDE
M left margin 8
V vertical spacing (n/216") 9     L line length 64
A page length (text lines) 60
Q form length (inches) 11
G paging OFF
D font drive 0                   R draft mode   ON
J justification ON               X text drive   0
C condensed OFF                  H type height  Nrm
N paragraph-end Returns 1        E expanded x1
               COMMANDS:
```

Now everyone can use the BBC Micro or Electron to design superb fonts and print them on an Epson-compatible printer. It's easy to use, and the results look so professional.

How? Just type in your text using your favourite word processor – Mini Office II, View, Wordwise and Wordwise Plus are all fully supported – put in the easy to remember formatting codes and save it. Then load up the FontStyle Print program and in minutes you have a professional, high quality output.

YOU CAN:

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Say goodbye to boring dot-matrix printer fonts! With this package, the clearly written manual and your imagination you can produce perfect results every time.

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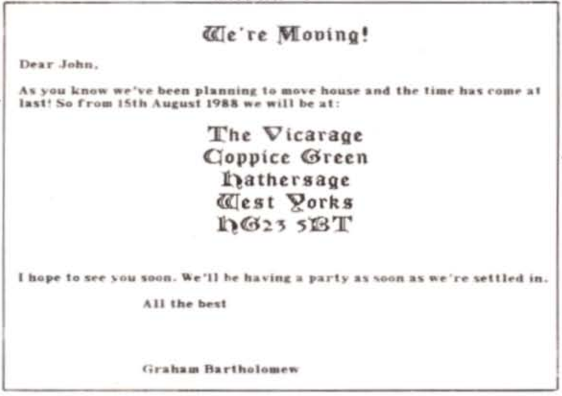

We're Moving!

Dear John,

As you know we've been planning to move house and the time has come at last! So from 15th August 1988 we will be at:

The Vicarage
Coppice Green
Hathersage
West Yorks
HG23 5BT

I hope to see you soon. We'll be having a party as soon as we're settled in.

All the best

Graham Bartholomew

Example output

TO ORDER PLEASE USE THE FORM ON PAGE 143

◀ **From Page 125**

- *If one Beasty bumps into another he eats it immediately and the victim is reincarnated.*
- *If Boris eats a Beasty, all the Beasties die and if he has eaten less than three – four under certain conditions – they are all reincarnated.*
- *The Galactic Game Player controls the lines of force which govern the direction in which the Beasties move.*
- *The directions of the lines are initially set at random and move uniformly in clockwise steps of 90 degrees.*
- *At each move the Galactic Game Player chooses by how many steps the lines of force turn – between zero and three.*
- *Points are gained by guiding the Beasties into the large blue squares, but if more than one occupies a square only the first is taken into account.*
- *Points are awarded only if claimed. The more squares occupied, the more points there are to be gained.*
- *The points are awarded as follows:*

Squares occupied	***Points***
1	50
2	250
3	1,000
4	3,000

- *There are three stages to the game – keep your eye on the stage as it changes with a minimum of fuss – and points may only be claimed if the number of boxes occupied is greater than or equal to the stage.*
- *If more than 1,500 points are gained, an extra life is awarded to the Beasties.*
- *If a Beasty wanders over the edge of the game area, he will be transported to the point directly opposite.*
- *Boris can never leave the game area.*
- *You are the Galactic Game Player.*

```
   10 REM  BEASTY BUGS
   20 REM  by Patrick Whittaker
   30 REM  (c) The Micro User
   40 *TV255
   50 *FX229,1
   60 *FX4,1
   70 DIMsq%(10,10),coin%(3,1),c%(3,1),b
ox%(3),boris%(1)
   80 MODE4:VDU23;8202;0;0;0;:@%=1
   90 VDU23,240,24,60,126,255,24,24,24,2
4
  100 VDU23,241,8,12,14,255,255,14,12,8
  110 VDU23,242,24,24,24,24,255,126,60,2
4
  120 VDU23,243,16,48,112,255,255,112,48
,16
  130 VDU23,244,66,231,66,126,219,60,90,
165
  140 VDU23,245,24,126,219,126,60,90,153
,165
  150 VDU23,246,66,165,126,90,189,153,36
,36
  160 VDU23,247,36,24,126,126,255,219,21
9,102
  170 high%=0
  180 COLOUR129
  190 GCOL4,0
  200 VDU19,0,4,0,0,0
  210 COLOUR0
  220 PROCstart
  230 stage%=1:move%=5:score%=0:tally%=0
:lives%=3:go%=0:extra%=FALSE
  240 PROCscreen:PROCinit:PROCtitle:PROC
coin:PROCarrows
  250 REPEAT
  260 IF lives%=0 GOTO 350
  270 PROCgo
  280 IF A%=64 PROCreset:GOTO260
  290 IF dir%>0 PROCturn
  300 PROCmove
  310 IF spider%=TRUE tally%=0:PROCreset
:GOTO 260
  320 PROCboris
  330 IF spider%=TRUE tally%=0:PROCreset
:GOTO 260
  340 IF go%MOD 10=0 stage%=stage%+1:SOU
ND0,-vol%,1,2:IF stage%>3 stage%=3
  350 UNTIL lives%=0
  360 PROCfinish
  370 GOTO230
  380 END
  390 DEFPROCstart
  400 vol%=15
  410 CLS
  420 FORX%=0TO28
  430 PRINTTAB(X%,X%)"BEASTY BUGS!"
  440 FORdelay%=0TO200:NEXT
  450 NEXT
  460 PROCbox(100,200)
  470 PRINTTAB(4,16)"SELECT"
  480 PRINTTAB(4,17)"VOLUME"
  490 PRINTTAB(11,19)"TAB TO"
  500 PRINTTAB(11,20)"CHANGE"
  510 PRINTTAB(11,22)"RETURN TO"
  520 PRINTTAB(11,23)"START GAME"
  530 REPEAT
  540 REPEAT:PRINTTAB(6,21)vol%;" ":A%=G
ET:UNTIL A%=9 OR A%=13
  550 IF A%=9 vol%=(vol%+1)MOD16
  560 UNTIL A%=13
  570 ENDPROC
  580 DEFPROCinit
  590 FORX%=0TO10:FORY%=0TO10
  600 sq%(X%,Y%)=RND(4)
  610 NEXT:NEXT
  620 coin%(0,0)=4
  630 coin%(0,1)=4
  640 coin%(1,0)=6
  650 coin%(1,1)=4
  660 coin%(2,0)=4
  670 coin%(2,1)=6
  680 coin%(3,0)=6
  690 coin%(3,1)=6
  700 boris%(0)=5:boris%(1)=10
  710 FOR X%=0TO3:FORY%=0TO1
  720 c%(X%,Y%)=coin%(X%,Y%)
  730 NEXT:NEXT
  740 ENDPROC
  750 DEFPROCscreen
  760 CLS:VDU5
  770 FORX%=80TO960STEP80
  780 MOVE20,X%
  790 DRAW900,X%
  800 NEXT
  810 FORX%=20TO900STEP80
  820 MOVEX%,80
  830 DRAWX%,960
  840 NEXT
  850 ENDPROC
  860 DEFPROCarrows
  870 FORX%=0TO10:FORY%=0TO10
  880 MOVE 25+(X%*80),155+(Y%*80)
  890 VDU(239+sq%(X%,Y%))
  900 IF X%MOD2=0 SOUND1,-vol%,20+X%*Y%,
1
  910 NEXT:NEXT
  920 ENDPROC
  930 DEFPROCgo
  940 go%=go%+1:A%=0:dir%=0:VDU4
  950 move%=move%+1:IF move%>6 move%=1
  960 PRINTTAB(31,23)lives%
  970 PRINTTAB(20,0)move%
  980 PRINTTAB(33,6)stage%
  990 PRINTTAB(38-LEN(STR$(score%)),19)s
core%
 1000 PRINTTAB(16,30)high%
 1010 REPEAT
 1020 PRINTTAB(34,14) dir%
 1030 PRINTTAB(36,9)vol%;" "
 1040 *FX15,0
 1050 REPEAT:A%=GET:UNTIL A%=32 OR A%=13
 OR A%=64 OR A%=9
 1060 IFA%=32dir%=(dir%+1)MOD4
 1070 IF A%=9 vol%=(vol%+1)MOD16
 1080 UNTIL A%=13 OR (A%=64 AND tally%>=
stage%)
 1090 VDU5
 1100 ENDPROC
 1110 DEFPROCturn
 1120 FORX%=0TO10:FORY%=0TO10
 1130 MOVE 25+(X%*80),155+(Y%*80)
 1140 VDU(239+sq%(X%,Y%))
 1150 sq%(X%,Y%)=((sq%(X%,Y%)+dir%-1)MOD
4)+1
 1160 MOVE 25+(X%*80),155+(Y%*80)
 1170 VDU(239+sq%(X%,Y%))
 1180 SOUND0,-vol%,3,1
 1190 NEXT:NEXT
 1200 ENDPROC
 1210 DEFPROCcoin
 1220 LOCAL X%
 1230 FORX%=0TO3
 1240 MOVE 60+(coin%(X%,0)*80),120+(coin
%(X%,1)*80)
 1250 VDU244+X%
```

Turn to Page 129 ▶

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10+ 27128 250nS 21V	3.87	4.45
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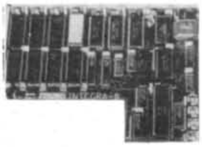
INTEGRA-β



The Expansion for the BBC Model B

The INTEGRA-β provides four operation modes - as standard Beeb or with shadow Ram and emulation of 'B+' and Master 128 features. Ideal for educational, commercial and data collection applications, as well as the private user.

An included battery-backup system, (which covers all fitted Ram), can save any data in Ram during a power-line disturbance or when the computer is switched off. Also, Rom images can be loaded from disc, stored and cleared at will, minimising the need for physical Rom changes. Compatible with DFS, ADFS and second processors conforming to ACORN® protocols.

Enjoy the facilities offered by the INTEGRA Operating System which allows you to run Model 'B+' versions of programmes with their added features also provides many of the features otherwise only available in the Master series. Control of sideways Ram even exceeds that available in the Master. Includes comprehensive machine configuration means, real-time clock with date, calendar and alarm features and commands for controlling the working environment. Will additionally allow use of the type 65C02 processor with it's enhanced instruction set.

Compatible with many applications, some of which are,

Inter-Word, Inter-Sheet, Inter-Base , Wordwise Plus from Computer Concepts. View-Sheet, View 3 from Acornsoft. AMX Super-Art, AMX Stop Press! from Advanced Memory Systems. The Publisher and Genie from Permanent Memory Systems. Music 5000 System and Ample from Hybrid Technology.

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INTEGRA-β	£130.00	£122.00	£118.00
32K Ram Chip*	£13.34*	£12.00*	£12.00
Dual WP Switch§	£7.00§	£8.00§	£7.00
Extra Switch*	£1.50	£1.50*	&1.50
65C02 CPU*	£8.75*	£8.75*	£8.75

If ordering separately add as indicated for P&P

*	£1.00	£2.00
§	£2.50	£4.00

The WP Switch has two switches fitted with room for four more. Each switch controls two 16K banks. Fits at rear of BBC casing and leads push-on to board pins.

COMPUTECH
The Garth, Hampsfell Road, Grange over Sands, Cumbria. LA11 6BG
Telephone: 044 84 4604

◀ From Page 127

```
 1260 NEXT
 1270 MOVE 60+(boris%(0)*80),120+(boris%
(1)*80)
 1280 VDU42
 1290 ENDPROC
 1300 DEFPROCmove
 1310 spider%=FALSE
 1320 FORX%=0TO3
 1330 jump%=0
 1340 REPEAT
 1350 jump%=jump%+1
 1360 MOVE 60+(coin%(X%,0)*80),120+(coin
%(X%,1)*80):VDU244+X%
 1370 IF sq%(coin%(X%,0),coin%(X%,1))=1
coin%(X%,1)=coin%(X%,1)+1:GOTO1410
 1380 IF sq%(coin%(X%,0),coin%(X%,1))=2
coin%(X%,0)=coin%(X%,0)+1:GOTO1410
 1390 IF sq%(coin%(X%,0),coin%(X%,1))=3
coin%(X%,1)=coin%(X%,1)-1:GOTO1410
 1400 IF sq%(coin%(X%,0),coin%(X%,1))=4
coin%(X%,0)=coin%(X%,0)-1
 1410 IF coin%(X%,0)=-1 coin%(X%,0)=10
 1420 IF coin%(X%,1)=-1 coin%(X%,1)=10
 1430 IF coin%(X%,0)>10 coin%(X%,0)=0
 1440 IF coin%(X%,1)>10 coin%(X%,1)=0
 1450 PROCtouch
 1460 SOUND1,-vol%,128,1
 1470 MOVE 60+(coin%(X%,0)*80),120+(coin
%(X%,1)*80):VDU244+X%
 1480 FORdelay%=1TO2000:NEXT
 1490 PROCcheck
 1500 UNTIL sq%(coin%(X%,0),coin%(X%,1))
=5 OR jump%=move% OR spider%=TRUE
 1510 IF spider%=TRUE X%=7
 1520 NEXT
 1530 ENDPROC
 1540 DEFPROCtouch
 1550 FOR Y%=0TO3
 1560 IFX%=Y% GOTO 1580
 1570 IF coin%(X%,0)=coin%(Y%,0) AND coi
n%(X%,1)=coin%(Y%,1) PROCeat
 1580 NEXT
 1590 IF boris%(0)=coin%(X%,0) AND boris
%(1)=coin%(X%,1) spider%=TRUE
 1600 ENDPROC
 1610 DEFPROCtitle
 1620 go%=0
 1630 PROCbox(106,166)
 1640 PROCbox(586,166)
 1650 PROCbox(106,646)
 1660 PROCbox(586,646)
 1670 MOVE920,910:PLOT1,360,0
 1680 MOVE920,770:PLOT1,360,0
 1690 MOVE920,650:PLOT1,360,0
 1700 MOVE920,500:PLOT1,360,0
 1710 MOVE920,360:PLOT1,360,0
 1720 MOVE920,220:PLOT1,360,0
 1730 MOVE920,1024:DRAW920,0
 1740 VDU4
 1750 PRINTTAB(29,1)"BEASTY BUGS"
 1760 PRINTTAB(31,4)"STAGE"
 1770 PRINTTAB(30,9)"SOUND"
 1780 PRINTTAB(29,12)"SWINGOMETER"
 1790 PRINTTAB(32,17)"SCORE"
 1800 PRINTTAB(33,23)"LIVES"
 1810 PRINTTAB(4,0)"BEASTY FACTOR ="
 1820 PRINTTAB(31,26)"SCORING"
 1830 PRINTTAB(30,27)"POTENTIAL"
 1840 PRINTTAB(2,30)"HIGH SCORE ="
 1850 VDU5
 1860 GCOL4,0
 1870 ENDPROC
 1880 DEFPROCeat
 1890 MOVE 60+(coin%(Y%,0)*80),120+(coin
%(Y%,1)*80):VDU244+Y%
 1900 coin%(Y%,0)=c%(Y%,0):coin%(Y%,1)=c
%(Y%,1)
 1910 SOUND1,-vol%,20,1
 1920 MOVE 60+(coin%(Y%,0)*80),120+(coin
%(Y%,1)*80):VDU244+Y%
 1930 ENDPROC
 1940 DEFPROCbox(x%,y%)
 1950 MOVE x%,y%
 1960 PLOT1,231,0
 1970 PLOT1,0,231
 1980 PLOT1,-231,0
 1990 PLOT1,0,-231
 2000 ENDPROC
 2010 DEFPROCcheck
 2020 LOCAL X%
 2030 FORX%=0TO3:box%(X%)=0:NEXT
 2040 FORX%=0TO3
 2050 IF coin%(X%,0)>0 AND coin%(X%,0)<4
 PROCbox0and2
 2060 IF coin%(X%,0)>6 AND coin%(X%,0)<1
0 PROCbox1and3
 2070 NEXT
 2080 tally%=0
 2090 FORX%=0TO3
 2100 potential$="ZERO"
 2110 IF box%(X%)=1 tally%=tally%+1
 2120 IF tally%=1 potential$=" 50 "
 2130 IF tally%=2 potential$="250 "
 2140 IF tally%=3 potential$="1000"
 2150 IF tally%=4 potential$="3000"
 2160 VDU4:PRINTTAB(32,29)potential$:VDU
5
 2170 NEXT
 2180 ENDPROC
 2190 DEFPROCbox0and2
 2200 IF coin%(X%,1)>0 AND coin%(X%,1)<4
 box%(0)=1
 2210 IF coin%(X%,1)>6 AND coin%(X%,1)<1
0 box%(2)=1
 2220 ENDPROC
 2230 DEFPROCbox1and3
 2240 IF coin%(X%,1)>0 AND coin%(X%,1)<4
 box%(1)=1
 2250 IF coin%(X%,1)>6 AND coin%(X%,1)<1
0 box%(3)=1
 2260 ENDPROC
 2270 DEFPROCreset
 2280 IF tally%=0 lives%=lives%-1
 2290 IF tally%=1 score%=score%+50
 2300 IF tally%=2 score%=score%+250
 2310 IF tally%=3 score%=score%+1000
 2320 IF tally%=4 score%=score%+3000
 2330 IF lives%=0 ENDPROC
 2340 IF extra%=FALSE AND score%>1499 li
ves%=lives%+1:extra%=TRUE
 2350 PROCarrows:PROCcoin:PROCinit:PROCa
rrows:PROCcoin:tally%=0
 2360 VDU4:PRINTTAB(32,29)"ZERO":VDU5
 2370 ENDPROC
 2380 DEFPROCboris
 2390 spider%=FALSE
 2400 LOCAL X%
 2410 jump%=0
 2420 REPEAT
 2430 jump%=jump%+1
 2440 MOVE 60+(boris%(0)*80),120+(boris%
(1)*80):VDU42
 2450 dir%=RND(5)
 2460 IF dir%=1 boris%(1)=boris%(1)+1
 2470 IF dir%=2 boris%(0)=boris%(0)+1
 2480 IF dir%=3 boris%(1)=boris%(1)-1
 2490 IF dir%=4 boris%(0)=boris%(0)-1
 2500 IF jump%<4 AND dir%=5 GOTO2450
 2510 IF boris%(0)>10 boris%(0)=9
 2520 IF boris%(0)<0 boris%(0)=1
 2530 IF boris%(1)>10 boris%(1)=9
 2540 IF boris%(1)<0 boris%(1)=1
 2550 SOUND1,-vol%,7,1
 2560 MOVE 60+(boris%(0)*80),120+(boris%
(1)*80):VDU42
 2570 FORdelay%=1TO3000:NEXT
 2580 FOR X%=0TO3
 2590 IF coin%(X%,0)=boris%(0) AND coin%
(X%,1)=boris%(1) spider%=TRUE:X%=7
 2600 NEXT
 2610 UNTIL dir%=5 OR spider%=TRUE
 2620 ENDPROC
 2630 DEFPROCfinish
 2640 IF score%>high% high%=score%
 2650 PROCcoin
 2660 PROCarrows
 2670 VDU4
 2680 CLS
 2690 PRINTTAB(4,2)"YOU SCORED ";score%
 2700 PRINTTAB(2,30)"HIGH SCORE = ";high
%
 2710 PRINTTAB(4,12)"ANOTHER GAME (Y/N)?
"
 2720 REPEAT:A$=GET$:UNTIL A$="Y" OR A$=
"y" OR A$="N" OR A$="n"
 2730 IF A$="N" OR A$="n" END
 2740 ENDPROC
```

Get it right!

```
 10 =    0 0
 20 =    0 0
 30 =    0 0
 40 = 4ACF F
 50 = 5C2A A
 60 = E383 A
 70 = D67B 4
 80 = 7A09 1
 90 = 4D06 4
100 = 3B5D C
110 = 239F 6
120 = 63FB 0
130 = FA80 D
140 = F586 2
150 = 5B22 4
160 = 5FAE 8
170 = BDF8 C
180 = B74A 1
190 = CFCE 7
200 = FEAE 3
210 = F968 B
220 = 9D5F A
230 = 7065 E
240 = 9319 3
250 = BFBA 9
260 = D407 0
270 = 82C6 F
280 = AD33 7
290 = D0B5 3
300 = 3227 F
310 = F447 4
320 = 83B1 6
330 = F447 8
340 = B7AE 8
350 = 1358 3
360 = 62F4 7
370 = 5206 9
380 = FD2E C
390 = 363B F
400 = 7105 F
410 = 7A16 D
420 = 35F0 B
430 = 7440 8
440 = 1D6B D
450 = 2C83 4
460 = D55E B
470 = B6FF 3
480 = 16FB 9
490 = 923A F
500 = 49B1 F
510 = 4BB6 B
520 = ABF7 2
530 = BFBA 9
540 = 76B4 A
550 = 7DB5 0
560 = 77C8 4
570 = ED0F 0
580 = 344C 5
590 = BEA2 7
600 = BF3F 0
610 = 24BD 6
620 = 6596 8
630 = 1322 6
640 =   74 9
650 = 5682 2
660 = EED6 0
670 = B820 C
680 = 8B34 0
690 = FD80 4
700 = 36C5 1
710 = D0C5 B
720 = 288D D
730 = 24BD A
740 = ED0F F
```

Turn to Page 130 ▶

◀ From Page 129

```
 750 = F5B9 A
 760 = D202 C
 770 = A251 1
 780 = E429 F
 790 = 8C98 C
 800 = 2C83 C
 810 = 804C 7
 820 = 5507 8
 830 = 279A 3
 840 = 2C83 C
 850 = ED0F 1
 860 = AB3A 7
 870 = BEA2 4
 880 = 600A 4
 890 = F342 2
 900 = CB60 C
 910 = 24BD A
 920 = ED0F 6
 930 = 1343 F
 940 = DBF2 5
 950 = 4F55 4
 960 = EDA1 A
 970 = 3072 7
 980 = 827D D
 990 = D727 A
1000 = 3ECF 7
1010 = BFBA 5
1020 = D3EC 5
1030 = F5A5 B
1040 = 6C86 E
1050 = 2982 8
1060 =  D7C 5
1070 = 7DB5 B
1080 = F2C0 D
1090 = 667A A
1100 = ED0F 7
1110 = C90D C
1120 = BEA2 E
1130 = 600A 2
1140 = F342 4
1150 = 477C E
1160 = 600A 2
1170 = F342 5
1180 = 62C2 2
1190 = 24BD C
1200 = ED0F B
1210 = D8AC 1
1220 = 9956 E
1230 = D70A D
1240 = 8459 D
1250 = D0D0 8
1260 = 2C83 4
1270 = D765 B
1280 = 5340 3
1290 = ED0F 5
1300 = D8D0 0
1310 = F91C 7
1320 = D70A A
1330 = 14B6 4
1340 = BFBA 6
1350 =  B51 9
1360 = 34C7 1
1370 = D1FD 6
1380 = 5525 4
1390 = 5AAF 0
1400 = D0AF E
1410 = F31B 8
1420 = 6CF9 C
1430 = 71EA 0
1440 = D941 B
1450 = 836F 1
1460 = D733 2
1470 = 34C7 A
1480 = 88BD 8
1490 = C2CC C
1500 = C83B C
1510 = C8F8 4
1520 = 2C83 4
1530 = ED0F A
1540 = 280B E
1550 = 8471 9
1560 = ACDF 9
1570 = 6D88 C
1580 = 2C83 F
1590 = 8CE8 9
1600 = ED0F 9
1610 = F931 2
1620 = DB98 1
1630 = DB65 6
1640 = 47A5 B
1650 = E428 1
1660 = 78E8 2
1670 = 5150 6
1680 = B032 A
1690 = 13F4 3
1700 = 9F65 E
1710 = 65AF 9
1720 = 379D C
1730 =  89C 9
1740 = 765B E
1750 = F293 7
1760 = DD63 2
1770 = CF4A 8
1780 = C59F 3
1790 = 2D76 5
1800 = 1DFC 3
1810 = D7FB D
1820 =  FDD E
1830 = 8007 3
1840 = 7BB3 5
1850 = 667A B
1860 = CFCE B
1870 = ED0F 8
1880 = 122E 1
1890 = F38F 1
1900 =  341 4
1910 = 9E7A D
1920 = F38F 3
1930 = ED0F 1
1940 = 70D2 7
1950 = DE81 4
1960 = EA9F 2
1970 = 3B69 7
1980 = 2AA5 9
1990 = 5651 F
2000 = ED0F 3
2010 = 69A8 9
2020 = 9956 0
2030 = DDFC 5
2040 = D70A F
2050 = 1416 9
2060 = 4F12 9
2070 = 2C83 5
2080 = EBB8 A
2090 = D70A D
2100 = EDA1 0
2110 = 452D 8
2120 = 114A 2
2130 = 2393 1
2140 = AC68 A
2150 = D2F4 8
2160 = 9F4D 6
2170 = 2C83 B
2180 = ED0F C
2190 = 59A3 0
2200 = D529 0
2210 = 8B9E 9
2220 = ED0F 6
2230 = E3D3 0
2240 = A39D E
2250 = FD2A 1
2260 = ED0F 7
2270 = 469E 9
2280 = 2E30 0
2290 = 9672 7
2300 = AF49 F
2310 = 7EC9 A
2320 = 1BB8 0
2330 = 4C26 F
2340 = 9144 9
2350 = 2C23 E
2360 = 1FE6 9
2370 = ED0F 4
2380 = 28D5 F
2390 = F91C 2
2400 = 9956 C
2410 = 14B6 9
2420 = BFBA 0
2430 =  B51 A
2440 = 9EB7 E
2450 =  525 B
2460 = 45E5 7
2470 = E72D C
2480 = 2555 9
2490 =  390 D
2500 = 443F 0
2510 = BFB1 8
2520 = FA50 9
2530 = D9E7 0
2540 = 24C0 E
2550 = 664B A
2560 = 9EB7 A
2570 = CD1D 9
2580 = C1D1 3
2590 = EC17 9
2600 = 2C83 8
2610 = F0AB 6
2620 = ED0F 5
2630 =  275 A
2640 = 5D80 A
2650 = 325B 5
2660 = CBBB 9
2670 = 765B 3
2680 = 7A16 1
2690 = 6892 5
2700 = CE74 8
2710 = 9D92 7
2720 = 2382 7
2730 = D17E 0
2740 = ED0F 5
```

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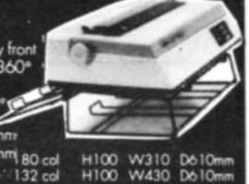

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£10 Prize letter

Elegant solution to Ample problem

MAY I congratulate you on being the first magazine to publish a tutorial on programming in Ample. How I wish this sort of information had been available when I started using this powerful language.

I have just read the second part of the series and this seems to be a suitable time to draw to the attention of newcomers to Ample that a known bug exists: It concerns the chord-rest (↑:) which was introduced in that part.

While the use of ↑: according to the examples given will not give any problems, if bar checking is enabled in a part that uses ↑: an error will result. The following will produce this error whenever part1 is used, even though the bars are correct:

```
"part1" [ SCORE 48, 4 BAR
          0: 48, C(EG) //^;:
                G(ED) //^;: ]
```

The reason seems to be that the bar-checking function does not correctly identify the length of the ↑: word. But with a powerful and extendible language like Ample the problem can be solved in several different ways:

☐ *I find the bar-checking function more useful than what is essentially just a shorthand form of a chord rest expression like ↑(↑ ↑), so the easiest solution is simply not to use the ↑; word.*

☐ *If you do want to use ↑: words – or have already written a piece that contains them – make sure that bar-checking is disabled in the parts that use them. This is achieved with the expression 0 BAR or by simply missing out the BAR word as SCORE sets 0 BAR automatically.*

☐ *You could re-define the ↑: word to be something else, as user words take priority over system words.*

You might think that the definition of the following word would have to contain the right number of rests to match the number of voices used in the chord part:

```
"^;"[^(^^^)]
```

In fact no error is produced if the definition contains too many rests, so as there can't be any more than eight voices assigned to a chord part for the Music 5000, a universal chord rest definition could look like:

```
"^;"[^(^^^^^^^^) ]
```

This is rather inelegant, but it does work and is easy to remember. A slightly more elegant solution would be to define a new word:

```
"\" [
   % "\ used instead of ";
MVAL? #2
   % Leave current length
5FOR(#12 #2)FOR
   % ( , setting) on stack
0,
   % Set length to zero
^;
   % Issue a chord-rest
,/
   % Get previous length
   % from stack and hold
   % the chord-rest for
   % that length.
]
```

As you can see, this definition does what the ↑: should do, but it is probably a bit over the top and difficult to remember. It does however show that a word in Ample is rather like a word used by Humpty Dumpty in Through the Looking Glass – it can mean whatever you choose it to mean.

Finally, it should be noted that some early versions of the Studio 5000 software require the RUN word to be defined explicitly. Therefore, relying on the RUN command to find part1, part2, part3 and so on might not work in all cases.

So the definition of:

```
"RUN" [ "123"PLAY ]
```

should be used to play a piece consisting of three parts called part1, part2 and part3, with the required instrument mix defined in a word called mix. – **Allan Gardner, Cramlington, Northumberland.**

* * *

I would like to thank you for the excellent feature on Ample that you recently ran – I have found it most enjoyable and informative. However I do have one problem. After following the instructions in the August and September 1988 issues I have found that when I type RUN at the very end, it does not run and instead I get a !mistake message.

Could you please tell me whether there has been a typing error on your part, or am I the one that has made the mistake? – **C. Ledwell, Bridgend, S.Wales.**

● ***Ian Waugh replies:*** To my knowledge the chord rest bug – ↑: – first came to public attention in Amplinex 003. Once you're aware of it, however, it shouldn't cause any problems – try one of Allan's many alternative solutions, or just don't use it in the Stave.

It doesn't cause a problem in the examples – deliberately so. Trying to condense the essentials of Ample into three articles was not easy, and

Turn to Page 136 ▶

The quest for screens

I HAVE recently built the video digitiser featured in the June 87 issue and it has given me many good results. I now have Watford's Quest Paint and Conquest and I typed in the screen converter from the February 1988 issue, hoping to be able to convert my screens for Quest Paint.

Everything works OK until I recall the screen in Quest Paint when I find it is split vertically with the two halves swapped. There is also some rubbish along the bottom.

*I realise that I must use the correct *SAVE routine, but when using the codes from *INFO of a Quest Paint screen, it does not work.*

Can you tell me the correct routine, or am I doing something wrong? – **Peter Walton, Norway.**

● The convert program saves a Mode 1 screen and this will load into Quest. You should not change the codes given in the listing as they represent the area of memory that needs saving. Quest uses a slightly different area, but will still load a screen saved using a command of the form:

```
*SAVE SCREEN 3000 +5000
```

Win a tenner

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◀ From Page 135

many things were left unsaid, the chord rest problem being one.

Allan's comment on the RUN command points to the cause of C. Ledwell's problem: Early Studio 5000 software did not include an automatic RUN command, and it would appear that Mr. Ledwell has an early version.

If any reader has Studio 5000 software release 3 or earlier they can upgrade to the current version free of charge by sending their issue disc plus a re-usable disc mailer and postage and packing to Hybrid Technology. Don't forget to include your name and address.

Note that if you have a Music 4000 you will already have the current Studio 5000 software, as this is on the Music 4000 issue disc. Don't be misled by the fact that your Music 4000 software may read Issue 1 or 2. You can tell what release your software is by listing – *TYPE – the !BOOT file.

The new RUN command automatically plays parts 1 to 8. If a mix word hasn't been defined it makes a mix word containing *Simpleins* for each part.

Double dose of DFSs

IN the June 1988 Problem Solved, *G. Keogh wanted to have both Acorn and Watford Electron DFSs installed. I would like to offer this solution to his problem:*

Program both on to a single 27256 – 32k – eprom. Bend pin 27 upwards and solder a 10k resistor between this and pin 14. Connect a SPST switch between pin 27 and pin 28. Plug this modified eprom into the micro and mount the switch in a convenient spot. To change between the DFSs – or any two roms – throw the switch.

In certain cases, Break or Control+Break may have to be pressed. Note that pin 27 is bent upwards and does not plug into the rom socket.

If you don't want to bend the pin on the eprom it could be mounted on a 28 pin socket and the modifications done on the socket.

Before I bought a Master I used this method extensively on my BBC B. I actually changed eight sockets on my ATPL rom board to accept 32k eproms, and hard-wired them to switches to select between the different roms.

I am rather old fashioned, and prefer physical switching to software selection.

I can assure you this system works flawlessly, but copyright is an issue here. However, the original copies of the manuals and roms on my bookshelf testify to the fact that all my roms were bought and not pirated. – **D.J.L. van de Bergh, Johannesburg, South Africa.**

Mike Cook comments: This is fine in theory, but bending back the pins of eproms can be tricky – you have to be careful that they don't break off. This is especially true if trailing wires are to be attached.

Software's future

PLEASE can you advise me how much longer software is going to be available for the BBC B? Our school is in the process of buying new micros courtesy of the PTA and we can't decide between a second-hand BBC B or new Master 128.

It is a first school – five to eight years old – and already has a BBC B and some software. – **Carol Johnson, via MicroLink.**

● Programs for the BBC B are likely to be available for as long as Master software. As you already have a BBC B and software, another would give you compatibility and, also, be cheaper than a Master. You'll find lots of second-hand ones advertised in *The Micro User* classifieds. You would, however not be able to run some of the more advanced software that is being released for the Master.

£10 Prize letter

Minimalists strike

THE ingenious Vuppy driver in the September 1988 issue shows what can be done with a bit of imagination. However, I often need a simple way of sending one-off control codes to the printer from the command page of View or ViewSheet.

As a fan of minimal computing I offer the following simple program:

```
 10 P%=&8C0:start=&8CB
:[OPT 2
 20 LDA #start MOD256:
STA &200
 30 LDA #start DIV256:
STA &201
 40 RTS
 50 LDA #2:JSR &FFEE
 60 LDA #1:JSR &FFEE
 70 TXA:JSR &FFEE
 80 LDA #1:JSR &FFEE
 90 TYA:JSR &FFEE
100 LDA #3:JMP &FFEE:]
110 *SAVE KODE 8C0 +40
```

*The machine code sits out of the way in the area reserved for envelopes one to four and makes use of the often neglected user vector. Simply *RUN KODE from any software. This sets up the user vector to point at the rest of the code.*

Subsequently typing:

```
*CODE n1 n2
```

will send the numbers n1 and n2 to the printer. Escape codes longer than two characters can be sent in two parts. For codes of odd length the last number can be omitted since it defaults to 0 – NUL code.

I have been using this routine for some time and find it invaluable. Incidentally, in reply to Mr. Yeo's problem with 127 bells in the September issue, 127 is approximately 3 x 10 ↑ 213 changes – found by adding logs, then taking the antilog of the decimal part. – **Phil Bender, Sunderland.**

Inverted graphics

HERE'S a program which will invert any graphics screen:

```
10 MODE n
20 *LOAD screen
30 FOR A%=HIMEM TO&8000
40 !A%=!A%EOR&FFFFFFFF
50 NEXT
```

This is very useful for screens which become negative when dumped on a printer. – **Stephen Youell, Sandy, Bedfordshire.**

Beating the odds

I HAVE enjoyed playing Chinese Chess from the May 1988 issue of The Micro User *but I have encountered what appears to be a small bug.*

In the two-player game, if one person captures all the opponent's pieces before capturing the den, the game

ALL programs printed in this magazine are exact reproduction of listings taken from running programs which have been thoroughly tested.

However, on the rare occasions when mistakes occur corrections are published as a matter of urgency. Should you encounter error messages when you type in a program, they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the letters pages.

refuses to progress further and produces illegal move messages. Can you help? – **Peter Hatterley-Greene, South Canterbury, New Zealand,**

● We can't see how the program can be changed but maybe one of our readers can help. However, if you've captured all the pieces you can safely say you've won since nothing can stop you.

Catalogue capers

AFTER typing in the ADFS catalogue program from the October 1988 issue of The Micro User *on my Master 128 with Acorn ADFS I checked it, got it right, followed all the instructions and at last got to boot the prepared catalogue disc. Alas all I got was:*

```
Channel 57 at line 60
```

Not only that, if I tried:

```
*TYPE DISC
```

the screen fills with ZZZZZs. But when I CHAIN the program it works. Why is this? I had no trouble at all when I tried it on the Archimedes. – **Peter MacDonald, Wincanton, Somerset.**

● The source of this error was revealed in the September Letters by Polly Kidd: The Master has a bug connected with using *EXEC – which causes errors in file handling programs which are booted. The solution is to add the line:

```
0 *FX119
```

Becoming an expert

HERE are some observations on Francis Botto's interesting Expert Shell program from the November issue of The Micro User.

The fault diagnosis rules have been entered as:

```
IF symptom THEN cause
```

This determines the forward direction as being from symptom to cause.

Following a chain of rules from symptom to the final cause in the chain is called forward chaining. Backward chaining works back along the chain from each case until the desired symptom is found.

The program actually demonstrates forward chaining and not backward as stated in the article. The following listing contains the additions and changes to allow the chaining direction to be switched between Fwrd *and* Bwrd *– I have taken the short cut of putting the new option where* Quit *used to be:*

```
  45 N1%=1:N2%=2
  55 DIM dirn$(2)
  65 dirn$(1)="Fwrd":dirn$
(2)="Bwrd"
 145 IF option=1 PROCdirec
tion
 190 UNTIL FALSE:REM Never
 290 PRINTTAB(fl,3)CHR$129
SPC3dirn$(N1%)SPC4"Edit"SP
C2"Expert"SPC2"Load"SPC3"S
ave"
 690 IF FNinstr(rule$(N1%,
S%),A$)=1 PRINTSPC1rule$(N
2%,S%)
 770 IF FNinstr(rule$(N1%,
L%),A$)=0 THEN 800
 780 PRINTSPCD%"-"rule$(N2
%,L%)
 790 PROCbacktrack(rule$(
N2%,L%),D%+1)
1370:
1380 DEF PROCdirection
1390 NN%=N1%:N1%=N2%:N2%=
NN%
1400 ENDPROC
```

Here's an example:

```
IF no light
    THEN sudden failure
IF no light
    THEN gradual failure
IF sudden failure
    THEN blown bulb
IF gradual failure
    THEN flat battery
IF dim light
    THEN flat battery
```

Using forward chaining from the symptom no light *gives two causes:*

```
IF sudden failure
    THEN blown bulb
IF gradual failure
    THEN flat battery
```

Backward chaining from the cause flat battery *gives two symptoms:*

```
no light
  IF gradual failure
dim light
```

When all the rules have been entered you are faced with the problem of having to enter a symptom – or cause – exactly as it is held in the database. Entering these dummy rules will help:

```
IF symptom
    THEN no light
IF symptom
    THEN sudden failure
IF symptom
    THEN gradual failure
IF symptom
    THEN dim light
IF blown bulb
    THEN cause
IF flat battery
    THEN cause
```

Forward chaining from symptom *gives an index of symptoms, while backward chaining from cause gives an index of causes.* – **Brian MacKenzie, Aberdeen.**

Cooking the books

I WAS surprised to read in Mike Cook's review on Watford's latest filing system in the October 1988 issue that the standard Acorn system restricts the length of any file to 64k.

I did not believe this to be true and was able to confirm my belief by running the following short program on a BBC B with an Acorn DFS and with a blank 40 track disc in the drive:

```
10 X=OPENOUT"NUMBERS"
20 N%=0
30 REPEAT
40 N%=N%+1:PRINT#X,N%:PRINT N%
50 UNTIL N%=20377
60 CLOSE#X
70 END
```

All the integers in the range 1 to 20,377 are stored in the file NUMBERS. The completed file occupies almost the entire disc – 5 x 20,377 = 101,885 bytes which is equivalent to 99.5k or 398 sectors. – **Peter Davy, Wakefield, West Yorkshire.**

More lives in space

As an avid player of your games I typed in the Space Escape from the October 1988 issue of The Micro User *– I have to type games in as my mum won't get me a disc subscription.*

At line 760 I noticed a cheat in PROCpause which I deciphered as having to press Control, A,L and I simultaneously – after the author I suppose. If you press these keys in pause mode you will have 99 lives. I hope this helps anyone in trouble – **James Page, High Wycombe, Buckinghamshire.**

Parallel porting

I USE a Tandy DMP 105 printer with BBC B. It is not Epson-compatible and uses the serial port, but not the parallel one. Is it possible to achieve any degree of Epson compatibility and also make it operate via the parallel port?

Is Dumpout 3 the answer to my problem? – **G Hullah, Harrogate, North Yorks.**

● This is another case where what you're asking is not impossible but is impractical. You could write software to intercept the oswrch vector to modify commands as they are issued – and serial to parallel converters do exist. But it's probably simpler to get another printer. The Tandy DMP 105 is one of the few machines that Dump Out 3 can't handle. It can do dumps on any of the following:

Seikosha GP80/100
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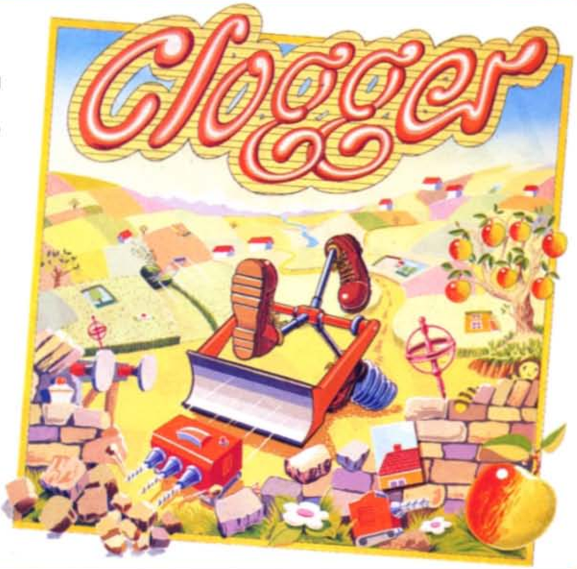

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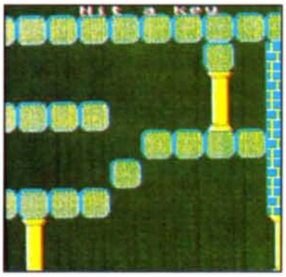

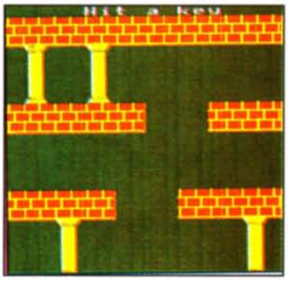

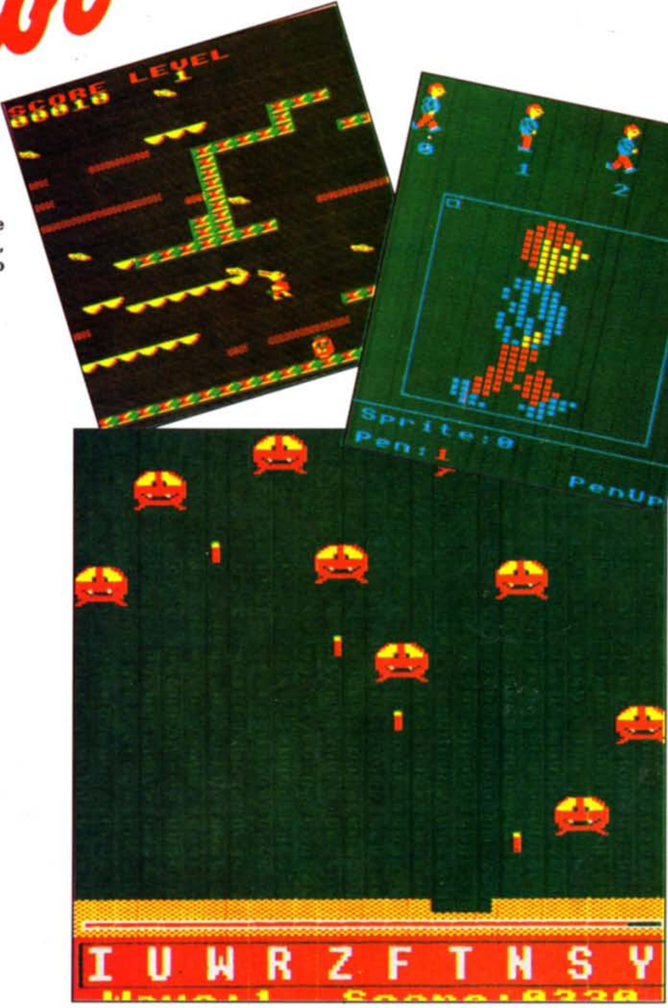

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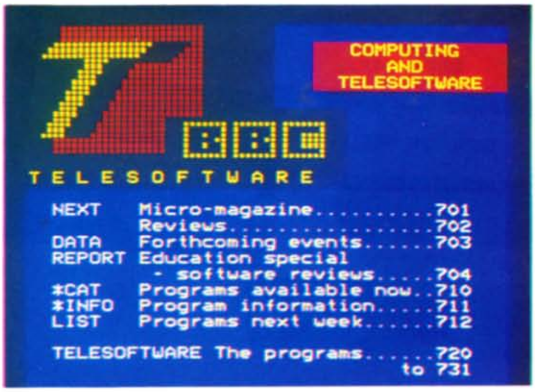

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         Reviews.................702
 DATA    Forthcoming events......703
 REPORT  Education special
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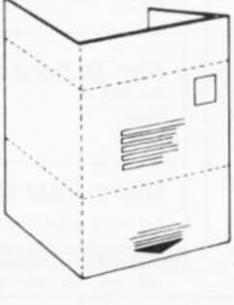

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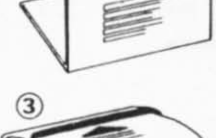

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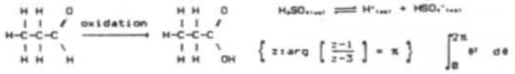

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Ace Computing 58
Apex Software 145
Apricot Studios 146
Atari 18,19
AVP 120
B&S Computing 13
Beebug 6,8,71,72
Care Electronics 80
Carswell Computers 145
Centec 14,118
Charm Microsoft 145
Clares 34,94
Computech 128
Computeck 14
Computer Concepts 56,57,76
Computer Repairs UK 24
Computaccount 40
Contex 89
CR Software 146
Dabs Press 118
Database Software 98
Datastore 134
Delta Computers 130
Derbyshire Software 146
Electro Music Research 134
Epic Software 92
Field Electronic 145
Impact Posters 15-17,147
Intergrex 124
Ixchel Software 145
Kosmos 146
Mandarin Software 97
Mayhew Telonics 145
M C Supplies 44
Meadow Computers 130
Meedmore Distribution 89
Melton Computer Supplies 29
Mewsoft 146
Microaid 80
Microboss 145
Microhelp 48
MicroLink 38
Microman Computers 28
Micromedia 131
Microsol 118
Micro Studio 131
Mijas Software 86
Minerva 3,37
Morley Electronics 122,123
Paul Fray 134
PMS Communications 30
PRES 65
Sabre Software 145
Selec Software 131
Silicon Vision 46
Simtron 24
Software Bargains 85
Superior Software 2,55,61,93,148
System Applied Technology 89
Technomatic 97
The Soft Option 58
Towerhill 10
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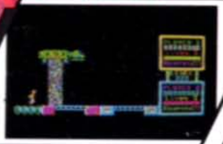
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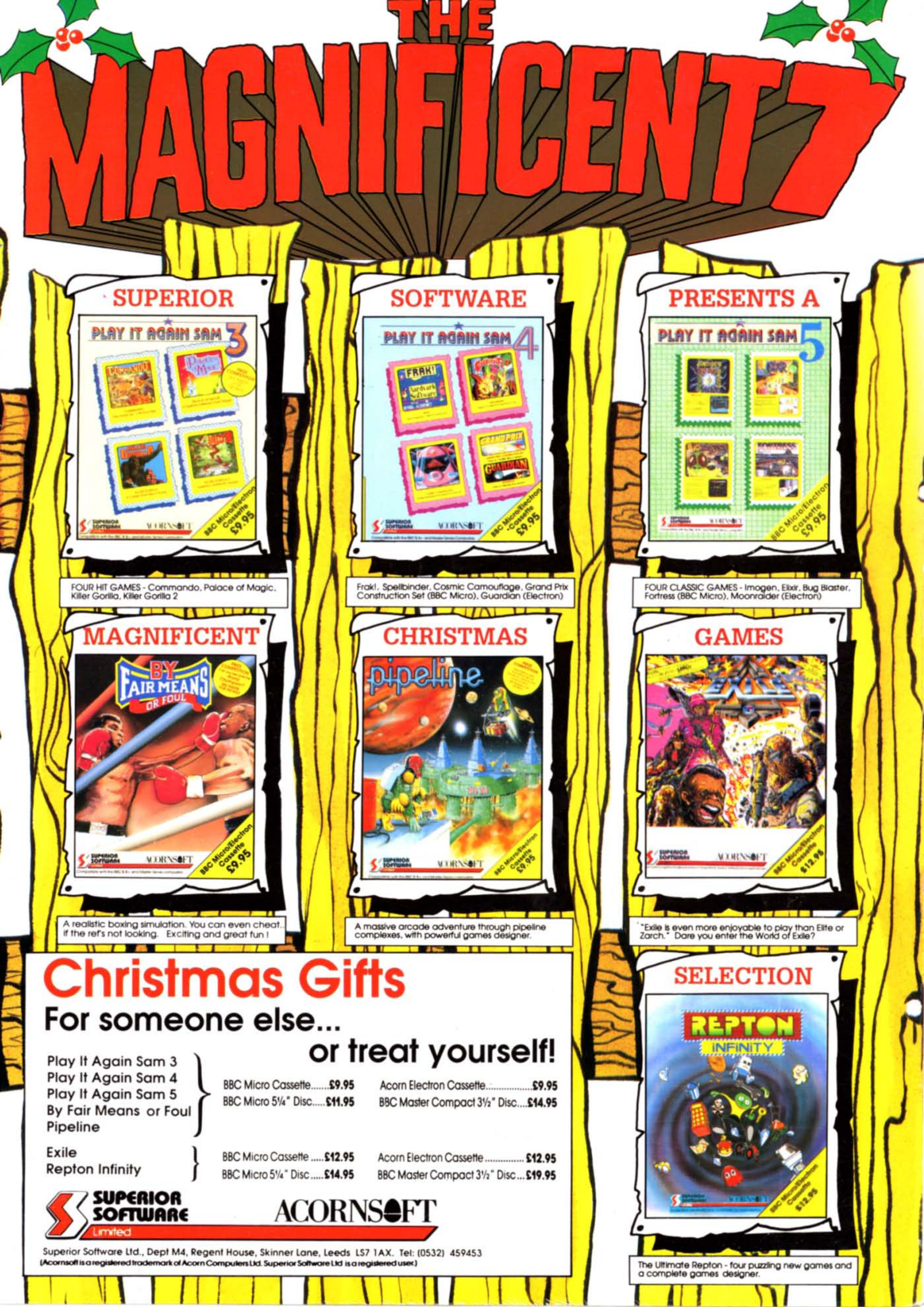
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